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ORIGINAL MEMOIRS.

THE TECHNIC OF COMPARATIVE HYPERÆMIA.

(MOSZKOWICZ'S SIGN.)

BY CHARLES GREENE CUMSTON, M.D.,

OF GENEVA, SWITZERLAND.

Privat-docent at the Faculty of Medicine.

IT is certain that as yet a definitive diagnostic value cannot be put upon comparative hyperæmia (Moszkowicz's sign), but it is still another means, and undoubtedly a most important one, placed at the disposal of the surgeon in estimating the proper point of amputation in cases of gangrene of the limbs. Nevertheless, the arterial pulsations should be sought for, the local temperature and cutaneous sensibility noted. When the hyperæmia is *perfectly distinct in its limits* it may be said that then the proper site of the amputation is absolutely indicated.

The object of the present paper is to indicate as clearly as possible the proper technic to be employed in the search for Moszkowicz's sign in order to avoid certain errors which might otherwise occur, and at the start it will be taken for granted that the reader is familiar with the principles upon which this diagnostic sign is based. The experiment consists in applying a rubber band at the root of the limb presenting gangrene, likewise one on the healthy mate, and then comparing on both limbs the rapidity and degree of color of the cutaneous hyperæmia following the removal of the constricting bands.

In principle, one proceeds as follows. The venous blood

is emptied as best possible out of the two limbs, in order to avoid any error in interpretation later on. A hæmostatic band is then applied at the roots of both limbs, which should be allowed to remain sufficiently long to produce anæmia of the tissues. The elastic bands are then simultaneously removed on both sides, and the observer follows the redness which extends from above downward on each extremity, at the same time noting the rapidity, the degree of color, and the point at which it stops.

These various stages of Moszkowicz's sign can be interpreted in several ways, and for this very reason it is essential to consider their execution in detail. The patient is placed in the dorsal decubitus and the venous blood is then expelled in various ways from the members to be examined. The simplest way is vertical elevation of the limb, as by gravity the column of venous blood makes its exit, but in order that the emptying shall be thorough this position must be maintained sufficiently long in order to avoid the return of the venous blood after arterial hæmostasis. In point of fact, in these cases the limb, instead of taking on the livid hue of nonvascularized tissues, assumes a violet tint which becomes confounded with the redness following the removal of the hæmostatic band. Here is a cause of mistake that must be eliminated at any cost, above all in the first trials made. Afterwards, from habit, it will be an easier matter to interpret the experiment, in spite of the cyanosis due to venous stasis.

In normal limbs, when the hæmostatic band is removed, there is a rapid regression of the violet hue which leaves the tissues decolorized after it. This paleness, succeeding the cyanosis and preceding the cutaneous hyperæmia, is to be interpreted in part like the latter; its rapidity and stopping point are the same as for the redness. Alone the tint does not vary. However this may be, the interpretation of these facts can only be arrived at when *both* limbs are cyanotic, a condition which is not usually met with. Consequently, it is better to avoid venous stasis with all the means at our disposal.

Many patients suffer intolerable pain when the diseased

lower limb is maintained in a vertical elevation, and therefore it is important to prolong this position as little as possible. Instead of allowing the venous blood to flow out by gravity, this may be hastened by massage directed toward the root of the member. An excellent means is to apply an elastic bandage, starting from the distal end and bringing it up to the upper part of the thigh, thus following the direction of the venous flow. This procedure, currently employed in operations for avoiding venous stasis, has the advantage of emptying with the greatest force the limb to be operated on. But a shadow dims this procedure, for it is to be feared that in cases of embolus a clot which has not become organized may become detached. However, it can be said that in the cases here considered, I am unaware that this accident has ever been recorded, and personally I have never had any disturbance of this kind in the few cases where I have employed it.

Arterial hæmostasis should be made as high up as possible at the root of the limb—at the axilla in the case of the arm, at the groin for the lower extremity. It is preferable to employ a rubber band or tube. Esmarch's tube is the one that produces the greatest degree of anæmia on account of its great compressive power, but in one case recorded by Mendelsohn it was powerless to compress the femoral artery on account of the rigidity of the walls of the vessel due to sclerosis. Some operators refuse to use it in cases of atheromatous gangrene, fearing that it might break the brittle vascular walls, but in cases in which it has been employed for Moszkowicz's sign it has given rise to no trouble. Personally I have never used it, simply because I preferred the flat band, which does not cut into the flesh so much and still produces quite sufficient anæmia for the production of the phenomena searched for. *Always bear in mind that a cyanosis subsisting in a limb after hæmostasis is applied may be due to an insufficient compression.*

The question of the duration of the hæmostasis is also important. The band should be left on long enough for the hyperæmia, following its removal, to be very marked, so as to give a distinct redness. However, the constriction becomes

very painful, even in normal limbs, when too long continued, and in a subject with gangrene it often sets up, from the commencement, severe pain in the diseased member. The pain is localized only in the portion involved by the pathologic process, commencing soon after the application of the band and ceasing only after the latter has been removed. The character of the pain varies, but generally it is of the intolerable shooting type; occasionally the patient will only be aware of a dead sensation or tingling localized in the gangrenous parts. When the band is removed the pain disappears and the patient experiences an agreeable sensation of warmth in the entire limb, and particularly in the part where the pain was severest. When the pain has been unbearable, I have resorted to somnoform, which has given the necessary relief without a profound narcosis.

The hæmostasis should be maintained for at least five or six minutes, when the anæmia will be sufficiently marked to contrast well with the hyperæmic redness. When the hæmostatic bands are removed great care must be taken that this be done simultaneously on both the diseased and healthy side. This is absolutely essential in order to estimate the rapidity of the hyperæmic wave and to compare it with the healthy side. As soon as the bands are removed both limbs are placed on the bed in the horizontal position. If the condition of the patient is such as to permit of being raised up, the reading of the sign may be done in the vertical position and this is advantageous, inasmuch as the progress of the flush can be observed on all aspects of the limb. But if the vertical position cannot be assumed without delay it must not be resorted to, as otherwise the wave of blood would be lost to the observer. In the upper extremities the horizontal position is also advantageous, because, if the arms are allowed to hang down the redness descends too quickly and the requisite details of the test are lost.

The best possible light is also very essential. This detail is far from useless, particularly in doubtful cases in which the hyperæmia is pale, or when there is partial arterial occlusion

or an imperfect arterial hæmostasis. Too much light, on the other hand, is not to be desired as it might blind the eye of the observer. It is better to turn the back to the light, for then there is no reflection and one can distinctly estimate the degree of redness following the removal of the bands. This stage of the examination, which is the *reading* of Moszkowicz's sign, is the most important.

As has been said, the integuments must have been prepared so as to offer a livid paleness. When the expression of the venous blood has been improperly done, when the arterial compression has been insufficient, a violet line results which greatly hinders the experiment.

As soon as the bands are removed a uniform, dark red blush normally invades both limbs from the point of compression to the tips. This blush progresses with the same rapidity on both sides, upon the express condition that the constriction is removed simultaneously. When there is arterial occlusion on one side the characters of the hyperæmic wave are changed, and it is upon this difference in the character of the diseased limb, compared with that of the healthy one, that the interpretation of the experiment is based.

There are three phenomena which vary in the hyperæmic wave in a limb the seat of arterial occlusion, namely, the rapidity of the wave, the intensity of its color, and its stopping point. In some instances both red bands progress with equal rapidity in the direction of the arterial flow, the only difference being that in the diseased limb there is a sudden cessation of the hyperæmic wave at the level of the vascular obliteration. In other cases the hyperæmia is very much paler on the diseased side and progressively fades from above downward, becoming blended at a point, difficult to distinctly recognize, with the paleness of the non-vascularized integuments. Between these two extremes there is a mean term, in the distribution of the hyperæmia.

When the constriction is removed the hyperæmia covers both limbs with the same intensity up to a certain point, and on the diseased side it suddenly changes in aspect; from a dark

red it changes to a pale pink hue which gradually blends with the colorless anæmic integuments of the diseased portion.

It has been said that in some cases both blood waves descend with the same intensity and rapidity up to the point of disease where the wave suddenly stops. But in practice it is not always so, for there may be a certain delay on the diseased side in the appearance of the cutaneous hyperæmia, the healthy side being already almost entirely covered when the phenomenon takes place in the mate. In this case it slowly descends to a certain point on the diseased limb, where it stops more or less suddenly. This slow progress of the hyperæmic wave generally is met with in the pale type.

To the third type, mentioned above in reference to the color, may be added a change in the quickness of the progress of the wave. At first there is a simultaneous departure and equal rapidity of the wave; then the rapidity decreases (in the diseased limb) at a distinct point where the dark red color suddenly stops. Here the pale area, of which we have spoken, progresses slowly.

An important point, often difficult to appreciate, is the estimation of the point where the hyperæmia stops or also the point where the color and rapidity of the waves change in character. In principle, this point varies according to the site of the arterial obliteration, but Moszkowicz considers that it corresponds exactly with the level of the occlusion.

According to the case, the cessation of the hyperæmic wave takes place suddenly on the diseased side in a transversal line. In other instances the level will be different on the external and internal aspects of the limb. Then, again, an area on the member may remain completely pale while the rest is more or less colored by the flush. This occurs more especially in the lower extremities. For example, the external aspect of the leg may remain perfectly pale, while there is hyperæmia of the posterior cutaneous surface.

Such are the conditions met with in practice. At present it seems to me that the diagnostic value of comparative hyperæmia should be limited to cases of gangrene due to vas-

cular occlusion, and in these cases the lower limit of the hyperæmic wave represents the point below which the tissues are no longer nourished. Although the sign of comparative hyperæmia quite nearly coincides with the level of the arterial occlusion in the leg, the same cannot be said when dealing with the thigh, because here it indicates the degree of the collateral circulation. It is, however, of all the clinical signs, the surest guide to the diagnosis of the point of amputation in cases of gangrene. This should be done quite a little above the lower limit of the hyperæmic area, even if one is obliged to sacrifice a certain amount of vascularized tissue.

VACCINE AND SERUM THERAPY IN SEPTICÆMIA.

A CLINICAL STUDY OF THE COURSE AND TREATMENT OF 111 CASES.

BY A. CAMPBELL BURNHAM, M.D.,

OF NEW YORK CITY.

THE advances in bacteriology and biologic therapy have been so great during recent years that an inquiry into the results of the modern treatment of severe general infections, in which a condition of bacteraemia is presumably present, needs no further justification.

One hundred and eleven consecutive cases of severe infection have been collected from the records of the Presbyterian Hospital, New York City, in which either the course and symptoms were those of septicæmia, or cultures showed the presence of bacteria in the circulating blood. These cases occurred between 1905 and 1913 and represent, not the therapy of one physician, but rather, the treatment of a group of physicians and surgeons on the various services of a general hospital. Moreover, during this period the recognized methods of treatment have, in themselves, undergone considerable change. During the earlier part of this period vaccines were never used, and serum only rarely, in the treatment of these general infections; and it was not until 1907 that the facilities of the hospital permitted systematic open-air treatment of ward cases.

The diagnosis of septicæmia is a loose one; many cases are often so diagnosed because of a continued fever of several days, or because of a high temperature associated with a localized infection. A few cases during this period have been excluded because of insufficient data on which to make the diagnosis, and throughout the paper the importance of a positive blood culture is emphasized. Cases in which the blood culture was not made, or showed no growth, have been included because, from a clinical stand-point, they resembled the cases of proved bacteraemia.

The cases are divided for purposes of study into five groups. Such a division is an arbitrary one; many cases might have been included equally well in either of two groups; but, in general, the cases fell naturally into a classification based upon the apparent cause or associated lesion which gave a particular characteristic to the picture of a generalized blood infection. The five classes are as follows:

1. Cases following abortion and labor.
2. Cases following infected wounds and abscesses.
3. Cases associated with osteomyelitis and arthritis.
4. Cases associated with malignant endocarditis.
5. Miscellaneous cases.

The mortality of the entire series (111 cases) was 74, or 66.6 per cent. This high mortality should be taken as an index of the class of cases treated rather than a criterion of the methods of treatment. Cases admitted to the hospital wards are often those in which treatment outside the hospital has failed. They are brought to the hospital after treatment at home has failed to alleviate the symptoms, and because the patients are rapidly growing more feeble. In some hospitals the mortality from septicæmia is given as low as 20 per cent. Such a low percentage must refer to a series of cases, in general, much milder than those included in this paper.

In order to facilitate comparison, the different classes of cases will be discussed separately.

1. *Cases Following Abortion and Labor.*—Under this heading there were 50 cases with a mortality of 54 per cent., the termination of 2 cases being unknown. Thirty cases followed labor and twenty cases followed abortion. In one case abortion was complicated by tonsillitis; and one case started as a pyelitis with septicæmia for which the treatment was an induced abortion.

The result of the blood culture was in accord with the experience of Western, who, in a careful analysis of 96 cases, found positive cultures in 40 per cent. In 22 cases of the present series the blood cultures were positive (44 per cent.), the majority of the positive cases showing streptococci in pure

culture. Two cases were due to the bacillus *aërogenes capsulatus*, two were due to staphylococci and the remainder were streptococcic bacteraemia.

In Western's¹ 39 cases, 36 showed streptococci, 2 staphylococci and 1 an unidentified coccus. The comparison between cases with positive blood cultures in this series and Western's, a total of 146 cases, is shown below.

	Blood culture			
	positive.	Recovered.	Died.	Result unknown.
Western (96 cases):				
Streptococci	36	10	26	0
Staphylococci	2	1	1	0
Present series (50 cases):				
Streptococci	18	7	10	1
Staphylococci	2	2	0	0
B. <i>aërog.</i> caps.	2	0	2	0
	—	—	—	—
Totals (146 cases)	60	20	39	1

Positive blood cultures then, in puerperal septicaemia, mean a mortality of about 66 per cent., and I have found no records of an extended series of cases in which the mortality of this type of cases was much less than this. These figures will be referred to later in reference to treatment.

The leucocyte count was made in nearly every case, often daily during the febrile stage of the disease. It was generally between 10,000 and 20,000. The count on admission has been studied as to its possible diagnostic or prognostic indications. The average admission count of 18 fatal cases was 19,000; and, of 18 cured cases, it was 14,900. This would apparently indicate that a high blood count is of bad prognostic significance. However, further study shows that the matter is not quite so simple. There were 9 counts of 10,000, or below, and of these 4 died and 5 recovered; there were nine admission counts of 25,000, or above, and of these 5 died and 4 recovered. However, it may be definitely stated that a high leucocyte count generally indicates a complication. Of the nine cases in which the leucocytes were 25,000 or over, this high count indicated a complication in eight cases, and in the

ninth case an especially virulent infection by the bacillus *aërogenes capsulatus*. In each of these eight cases the local condition causing the high leucocyte count finally required operation. The nature of the complication and the final results in cases showing high leucocyte counts are shown as follows:

Complication.	No. of cases. Operated on.		Died.	Recovered.
Pelvic abscess	4	4	2	2
Pneumonia, empyema	1	1	0	1
General peritonitis	1	1	1	0
Abscess (not abdominal)	2	2	1	1

In order to determine the significance of the leucocyte count in the different types of infection, the fatal and cured cases of positive (blood culture) streptococcic cases were compared. The average admission count of 9 fatal cases was 11,100, of 7 cured cases 12,300. Two cured staphylococcic cases showed counts of 12,500 and 10,300 on admission. Consequently the type of infection had little or no influence on the leucocyte count. Cases doing well under treatment usually showed a diminishing leucocyte count with a diminishing percentage of polynuclear cells, and fatal cases frequently showed a decreasing number of leucocytes with an increase of the polynuclears. This rule, however, was not invariable and in some cases it was found exactly reversed.

Of the complications occurring in puerperal septicæmia, peritonitis was the most common, occurring in thirteen cases; femoral phlebitis occurred in seven cases; bronchopneumonia and localized abscess, each in 3 cases; lobar pneumonia, endocarditis, empyema and arthritis, each in 2 cases; and meningitis, strangulated hernia, pyelonephritis, cerebral embolism and acute parotitis, each in one case. In four cases with a positive streptococcus blood culture, localized abscesses showed streptococci three times and staphylococci once.

The symptoms included fever, rapid pulse and prostration in every case. Chills were present in many of the fatal cases but showed no rule, and were often present in cases ending in recovery. A high temperature was a sign of the severity of the infection. About one-half of the cases had a tempera-

ture over 104° with a mortality of 66 per cent. Of the cases in which the temperature was generally below 104° the mortality was lower (about 45 per cent.).

The question as to operation, in septicæmia following abortion and labor, is unsettled. Murphy, De Lee, Watkins,² and others have strongly condemned operative interference in septic uteri. Hirst³ in a questionnaire sent to 273 authorities, including American and European surgeons and gynæcologists, found that while the majority (199) believed in cleaning out the uterus, a large number (74) believed in expectant treatment. It seems to be generally conceded, however, that after the uterus is once emptied it should be let alone and not re-entered except for hemorrhage.

In the present series the operative procedures are conveniently divided, for purposes of study, into the early operations, performed either before or shortly after admission to the hospital, and the late operations, performed after the patient had been under observation long enough to determine whether the infection was stationary or progressive. The late operations were usually performed from 15 to 30 days after admission, during which time the patient usually showed some improvement followed by a period in which the symptoms remained stationary or grew gradually worse.

FINAL RESULTS OF EARLY OPERATIONS.

Operation.	No. of Cases.	Cured.	Died.	Result unknown.
Curettage	21	9	10	2
Laparotomy and drainage	4	1	3	0
Herniotomy and curettage	1	0	1	0
No operation	24	11	13	0

Many of the cases received the curettage before coming to the hospital. It is also probable that some of the cases under the head of "no operation" were curetted before admission although they gave no history of an operative procedure before coming to the hospital.

Operations later in the course of the illness were necessary in 12 cases. In 8 cases the late operation was performed

after a preliminary curettage, tending to indicate that complications are more common after early operative interference. This is especially true of pelvic abscess which required drainage six times as often after curettage as after early expectant treatment.

LATE OPERATIONS FOLLOWING CURETTAGE.

	Cases.	Died.	Cured.
Laparotomy and drainage	5	2	3
Hysterectomy	1	1	0
Vaginal section	1	0	1
Thoracotomy	1	0	1

LATE OPERATIONS FOLLOWING EXPECTANT TREATMENT.

	Cases.	Died.	Cured.
Laparotomy and drainage	1	0	1
Vaginal section	1	0	1
Incision of abscess (not abdominal)	2	1	1

Owing to the uncertainty in the history of many patients, with reference to intra-uterine manipulations, it is difficult to form an estimate of the value of the two forms of early treatment. Ward, in giving the methods employed at the Sloane Hospital, outlines the treatment as follows: "If, despite the douches, the fever remains high . . . the interior of the uterus is explored. As far as possible all foreign material is removed, always with the idea of the minimum trauma, and a hot saline douche given. No packing or drainage is used unless hemorrhage occurs. . . . It should be said that if a post partum septic case is admitted to the hospital, this exploration takes place at once without waiting for the effect of vaginal and intra-uterine douches." Such procedure appears rational and sufficiently conservative to be in accord with the majority. To-day, there are few, if any, who believe in the more radical operations, such as hysterectomy and ligation of the pelvic veins, but the pendulum has swung so far in the opposite direction that many are urging absolute non-interference, even in cases in which the uterus is known to contain a large septic mass of retained secundines.

The treatment in all these cases was supportive and stimu-

lating. Some of the cases were treated in the open-air with distinct benefit to the appetite and the nervous symptoms. Others received drugs directed toward both the symptoms and the general condition. The data as to the use of any special drug is too limited to admit of any conclusions.

Serum and vaccine treatments have been tried in a sufficiently large number of the cases to be of considerable interest. At present the use of vaccines and serum in puerperal sepsis is not on a firm basis. It is generally believed that serum does no harm and may do some good, and vaccines, while valuable in chronic processes, can have little influence, except a harmful one, upon an acute process. This despite some excellent clinical reports, especially from Western,¹ Wynn⁴ and Rowlette,⁵ in England, as well as Medalia and Watson,⁶ Polak⁷ and others in America.

Antistreptococcic serum or vaccines, or in some cases a combination of both, were administered in 17 cases, with 11 recoveries and 6 deaths, a mortality of 35 per cent., as compared with the mortality of the remaining cases (68 per cent.), nearly double that of the cases receiving specific treatment.

Antistreptococcic serum is bactericidal and consequently must be used early. If its administration is delayed until the bacteriological examination is made, much valuable time is lost and good results cannot be expected. A large percentage of the cases of puerperal sepsis is due to the streptococcus. Based on uterine cultures, this figure is variously given from 28 per cent. (Williams⁸) to 78 per cent. (Young and Williams⁹). The streptococcus plays a still larger rôle in the bacteriæmic cases. The following table gives the percentage of streptococci, staphylococci and other bacteria in cases of bacteriæmia:

	Total cases.	Bacteri- æmia cases.	Streptococcus cases.	Staphylococcus cases.	Other bacteria.
Western	96	39	93 per cent.	5 per cent.	2 per cent.
Young and Williams	30	12	58 per cent.	17 per cent.	25 per cent.
Present series	50	22	82 per cent.	9 per cent.	9 per cent.

The paramount cause of puerperal septiciæmia, according to Watson and Medalia, is the streptococcus, which occurs in

86 per cent. of cases. If then, the streptococcus is present in such a large percentage of the cases, and if we admit the bactericidal properties of antistreptococcic serum, it should be given to every case of puerperal sepsis without waiting for a bacteriological diagnosis.

The vaccine used depends upon the infecting organism and if, as is generally agreed, autogenous vaccines are the best, a certain definite time must elapse before the vaccine can be prepared and administered. During this period the use of stock vaccines has been advised. The reports in favor of vaccine treatment have already been referred to. In a report to the American Gynecological Association, Williams, Cragin, and Newell¹⁰ say that little may be expected of vaccine treatment of puerperal sepsis; the most that can be said according to their report, is that vaccines do no harm. Theobald Smith¹¹ and Schwarz¹² hold somewhat similar opinions.

The results of the present series are distinctly favorable to both vaccine and serum therapy. In general, the mortality was lower in those cases where specific treatment was instituted; and the results seemed especially favorable when serum was given early followed by autogenous vaccine.

TABLE OF ALL CASES RECEIVING SPECIFIC THERAPY.

Treatment.	Cases.	Cured.	Died.
Serum alone	11	7	4 (36 per cent.)
Vaccine alone	3	2	1 (33 per cent.)
Serum and vaccine	3	2	1 (33 per cent.)

Reports of treatment of cases of proved bacteriæmia are even more favorable and indicate clearly the value of serum and vaccine therapy in severe blood infections. Of eleven cases treated by serum or vaccines 6 recovered and 5 died (mortality 46 per cent.). Of the six cured cases three received only serum, two received serum and vaccines and one was treated with vaccine alone.

It must not be argued against this series that the high mortality of the untreated cases is due to the inclusion of patients, moribund on admission, who died before vaccines

could be administered. On the contrary most of the untreated fatal cases of bacteriæmia occurred before the general use of vaccines and were under observation for from five to twenty days (5, 6, 11, 19, and 20 days respectively), a sufficient time to have instituted both serum and vaccine treatment had such been deemed advisable.

COMPARATIVE TABLE SHOWING RESULTS OF TREATMENT OF BACTERIÆMIA.

	Total cases.	Specific treatment.		No specific treatment.	
		Cases.	Died.	Cases.	Died.
1. Streptococcus.					
Western	36	23	14 (61 per cent.)	13	12 (92 per cent.)
Wynn .....	..	6	1 (17 per cent.)	..	..
Polak .....	..	28	6 (21 per cent.)	..	..
Present series	17	11	5 (46 per cent.)	6	5 (83 per cent.)
2. Staphylococcus.					
Western	2	1	0	1	1
Polak .....	..	12	1 (8 per cent.)	..	..
Present series	2	1	0	1	0

2. Cases Following Infected Wounds and Abscesses.—

There were twenty cases in this group with a general mortality of 75 per cent. Most of the cases occurred during early adult life as follows: 10 to 20 two cases; 20 to 30 ten cases; 30 to 40 five cases; over 40 two cases. Eleven cases followed lesions of the extremities, five followed lesions about the head, two followed tonsillectomy, one case followed erysipelas and one followed appendix abscess. The blood cultures were positive in 14 cases (streptococcus 9 times and staphylococcus aureus 5 times); in 3 cases there was no growth; and in 3 cases cultures were not made. A local cellulitis was the most common complication, occurring in 15 cases. Suppurative arthritis occurred in 5 cases, bronchopneumonia in 4 cases, adenitis in 2 cases and furunculosis, pericarditis, endocarditis, lung abscess, brain abscess, perineal abscess and erysipelas each in 1 case.

The leucocyte count showed little of prognostic value. A moderate leucocytosis was the rule and very high or very low counts were the exception. On admission the counts of the cured cases were between 11,000 and 22,400 (average 15,600). Of the rapidly fatal cases the lowest count on

admission was 6000 and the highest 36,000 average 20,600). No apparent difference could be made out between blood counts of the two types of bacteraemia. The highest count obtained (50,000) was in a child 11 years old (case 52). This high count fell to 16,000 in four days together with improvement in general symptoms. Unfortunately after an afebrile period, an abscess of the brain developed which ended fatally on the fifty-sixth day.

The differential counts were not significant, the polynuclear cells varying between 72 and 91 per cent. in the fatal cases, and 73 and 89 per cent. in the cured cases. In general a leucocytosis with a moderate or marked increase of the polynuclear elements was the rule and of diagnostic significance. The absence of a leucocytosis, however, does not exclude the possibility of septicæmia.

The treatment consisted of incisions of local accumulations of pus wherever present, together with the usual supportive measures. There were fourteen cases with a positive blood culture, with three recoveries and eleven deaths (89 per cent.), four of which received vaccines with a mortality of only 25 per cent. The mortality of the untreated cases in this series was 100 per cent. Two cases received vaccines in combination with antistreptococcic serum, one of which recovered. One case recovered under treatment with autogenous streptococcic vaccines and one recovered under treatment with stock staphylococcic vaccine.

TABLE SHOWING RESULTS OF VACCINE TREATMENT IN BACTERIÆMIA.

	Vaccines.		No vaccines.	
	Cases.	Died.	Cases.	Died.
Streptococcus	3	1	6	6
Staphylococcus	1	0	4	4
Totals	4	1*	10	10†

* 25 per cent. † 100 per cent.

It should be stated that the one case (Case 52) dying under vaccine treatment showed marked improvement following the use of vaccines and serum, and died on the fifty-sixth day after an operation for brain abscess.

Does the vaccine treatment favor the localization of purulent foci? In each of the cases treated by vaccines in this series one or more operations were necessary late in the course of the disease for the relief of localized collections of pus. In two cases the knee was involved, in the third case one of the phalanges showed osteitis and required operation, and in the fourth case there was a brain abscess which finally caused death.

The results of vaccine treatment in this series may be said to have been decidedly favorable and to warrant further trial.

3. *Cases Following Osteomyelitis and Arthritis.*—Nine cases occurred in this group with seven fatalities. Unlike the two preceding groups these cases occurred most commonly during childhood and showed other variations to the types discussed above. The youngest patient was five years old and seven of the nine cases occurred before the twenty-first birthday. The other two occurred in patients 35 and 36 years respectively. Five cases began as a monarticular arthritis and four began as a frank osteomyelitis. The arthritis cases were frequently treated for days or weeks before admission to the hospital. Indeed, the diagnosis may be very difficult, as is shown by the records of one patient (Case 28) who was in the hospital 10 days before the diagnosis could be made.

The blood cultures, again in contra-distinction to the other groups, showed the staphylococcus to be the most common etiological agent. Of six cases in which the blood culture was positive, the staphylococcus was present four times, and the streptococcus twice. In 40 cases of staphylococcic bacteriæmia collected by Soper,¹³ including the 4 cases in this series, osteomyelitis was present in 16 cases and suppurative arthritis in 10 cases.

The temperature in the two types of bacteriæmia showed some differences which were absent in the previous groups. In the streptococcus cases which were both rapidly fatal, the temperature was high, from 102° to 106°, while in the staphylococcus cases it was usually low, rarely going above 102°.

Bronchopneumonia was the most frequent complication, occurring in three cases; empyema and pyæmia each occurred in one case. Although five cases began as an apparent arthritis, practically every case showed osteitis in some form during the course of the disease.

The treatment of these cases consisted in operative procedures directed against the foci of infection and mechanical treatment for the inflamed joints, together with the usual supportive measures. Vaccines were used in four cases of staphylococcic bacteraemia with two recoveries and two deaths, a mortality of 50 per cent. which compares favorably with the mortality of the entire series which was 78 per cent. In fact, as was the case in the preceding group, the only cases which recovered were those receiving vaccines.

4. *Cases Associated With Endocarditis and Pericarditis.*—

For completeness these cases are included, for, while septicæmia is always present in malignant endocarditis, the condition is essentially different from the cases previously discussed and merits separate consideration. There were 16 cases, all showing a positive blood culture and all ending fatally. The results of the blood cultures were as follows:

Streptococci	12 cases
Streptococci and pneumococci.....	1 case
Staphylococci	2 cases
Meningococci	1 case

The disease was usually of long duration, many cases dying several months after the onset of symptoms. In a disease of such high mortality little can be learned from treatment. Five cases received vaccines, one received antistreptococcic serum and one received antimeningitis serum. The results were apparently nil. Wynn,⁴ who has had remarkably good results in other types of bacteraemia, has reported fifteen cases associated with endocarditis treated with vaccines with no recoveries.

5. *Miscellaneous Cases.*—Under this heading are included those cases which did not fall under the other headings. Of course cases where the blood culture gave evidence of a bacteri-

æmia which was part of the disease, as typhoid bacteriæmia in typhoid fever, were not included in this report. In a few the bacteriæmia was a complication to some other equally serious disease and little could have been expected from any plan of treatment. There were 16 cases with 11 deaths, and 4 recoveries and one case in which the final result is unknown. Infected uterine fibromata were the apparent cause of two cases, again emphasizing the rôle of the uterus in general blood infections. In two cases the septicæmia was apparently a complication of thrombophlebitis, making a total of nine cases in which the two conditions were associated. In three cases meningitis was complicated by bacteriæmia, one of which recovered. This case has been reported in detail by Bovaird¹⁴ (Case 45). The following table shows the cases in which there were positive blood cultures:

Case No.	Complication.	Blood culture.	Specific treatment.	Result.
16	Infected fibroids....	Streptococcus	None	Died fourth day.
45	None.....	Meningococcus	Serum	Cured.
48	Carcinoma,nephritis	Streptococcus	None	Died sixth day.
54	None.....	Bacillus proteus vulgaris	None	Cured.
57	Phlebitis.....	Streptococcus	None	Died second day.
60	Phlebitis,pneumonia	Staphylococcus	None	Died nineteenth day.
105	Cholelithiasis.....	Bacillus coli communis	None	Died nineteenth day.
107	Pyelonephritis.....	Bacillus coli communis	None	Died fifth day.
108	Multiple arthritis..	Gonococcus	Vaccine	Died sixtieth day.
109	Meningitis.....	Pneumococcus	None	Died third day.
110	Meningitis.....	Streptococcus	None	Died fourth day.
111	Typhoid.....	Bacillus coli communis	None	Cured.

The two cases of infected fibroids died shortly after hysterectomy, one case showing a positive blood culture. In general, the results of treatment in these miscellaneous cases have been bad, possibly due in part to the severity of the complicating disease.

A table of all the cases having a positive blood culture has been prepared in order to show more clearly the results of treatment. For obvious reasons Group 4 has been excluded. The cases in Group 5 have already been tabulated and, as will be easily seen, are unsuitable for comparison with the first three groups.

There are included in the table 42 cases of proved bacteriæmia, in 41 of which the final outcome is known. Case

68 left the hospital on the fourteenth day, and may be disregarded in computing the averages of the results of treatment.

CASES FOLLOWING ABORTION AND LABOR.

Case No.	Apparent cause or associated lesion.	Temperature.	Blood culture.	Local culture.	Complications.	Specific treatment.	Result.	Day.	Remarks.
1	Abortion	H	Strep.	Staph.	Meningitis	None	D	5	Pneumococcus meningitis.
11	Abortion	..	B. aer. caps.	.....	None	None	D	1	Culture made post mortem.
23	Abortion	M	Strep.	.....	Pneumonia	Vaccine on tenth day	D	11	
26	Abortion	L	B. aer. caps.	B. aer. caps.	Nephritis	None	D	1	
30	Abortion	M	Strep.	.....	Strang. hernia	Serum 100 c.c. on fifth day	D	6	
36	Abortion	H	Strep.	.....	None	Serum on first day	D	6	
39	Abortion	H	Strep.	.....	Pneumonia	Serum on fourth day	D	5	
62	Ante partum	M	Staph.	B. coli com.	Pyelitis	Vaccine bacillus coli	C	..	Abortion induced on 22nd day.
65	Post partum	M	Strep.	.....	Phlebitis	Vaccines	C		
66	Post partum	M	Strep.	.....	Phlebitis	None	D	11	
67	Post partum	H	Strep.	Strep.	Phlebitis	None	D	20	
68	Abortion	H	Strep.	.....	None	Vaccine dose 1	?		Left hospital 14th day.
70	Post partum	H	Strep.	.....	Phlebitis	None	D	19	
81	Post partum	H	Strep.	Strep.	Endocarditis pyæmia	None	D	6	
82	Post partum	M	Strep.	Sterile	Pelvic abscess	Serum on first day	C		
83	Post partum	L	Staph.	.....	Phlebitis, arthritis	Vaccine doses 2	C		
85	Post partum	M	Strep.	.....	Pyosalpinx	None	C		
86	Post partum	M	Strep.	.....	Phlebitis, axillary abscess, arthritis	Serum on first day, vaccine on third day	C		
88	Abortion	H	Strep.	Staph.	None	Serum on first day, vaccine on second day	D	11	
90	Post partum	H	Strep.	.....	None	Serum on fourth day	C		
92	Post partum	M	Strep.	Strep.	Pneumonia, empyema	Serum on first day	C		
95	Post partum	L	Strep.	.....	Phlebitis	Serum on first day, vaccine on second day	C		

Of these 41 cases there were 14 recoveries and 27 deaths, a general mortality of 66 per cent. There were 28 cases of streptococcic bacteriæmia with 9 recoveries and 19 deaths.

CASES FOLLOWING INFECTED WOUNDS AND ABSCESES.

Case No.	Apparent cause or associated lesion.	Temperature.	Blood culture.	Local culture.	Complications.	Specific treatment.	Result.	Day.	Remarks.
20	Cellulitis of face	H	Staph.	Staph.	None	None	D	2	
25	Infected wound	M	Staph.	Staph.	Arthritis	Vaccine on ninth day	D	11	
29	Infected wound	H	Strep.	Mixed	Abscess	Serum on eighth day	D	8	
31	Infected wound	H	Strep.	Mixed	Cellulitis	None	D	10	
33	Carbuncle	H	Staph.	Staph.	Osteomyelitis	Stock vaccine	C		
34	Furunculosis	L	Staph.	Staph.	Nephritis	None	D	5	
44	Infected wound	H	Strep.	Staph.	Cellulitis, pneumonia	Vaccine	C		
46	Infected wound	H	Strep.	Strep.	Cellulitis, pneumonia	None	D	13	
49	Tonsillectomy	H	Strep.	Mixed	Abscess of lung, pneumonia	None	D	5	
52	Infected wound	H	Strep.	.....	Brain abscess	Serum for eight days, vaccine on eighth day	D	56	Craniotomy on fifty-fifth day.
53	Erysipelas	H	Staph. aureus	.....	Erysipelas	None	D	2	
55	Infected wound	H	Strep.	.....	Perineal abscess	None	D	8	
56	Infected union	M	Strep.	.....	Endocarditis, arthritis	None	D	4	
80	Tonsillitis, abscess neck	H	Strep.	Strep.	Arthritis, cerv. abscess of knee	Serum on first day, vaccine on fifth day	C		

CASES FOLLOWING OSTEOMYELITIS AND ARTHRITIS.

Case No.	Apparent cause or associated lesion.	Temperature.	Blood culture.	Local culture.	Complications.	Specific treatment.	Result.	Day.	Remarks.
15	Osteomyelitis	H	Strep.	Mixed	None	None	D	2	
18	Osteomyelitis	L	Staph.	Staph.	Pneumonia, empyema	Vaccine 2 doses	D	14	
22	Osteomyelitis	L	Staph.	Staph.	None	Vaccines on eighth day	C		
24	Osteomyelitis	M	Staph.	Staph.	Pyæmia	Vaccines	D	28	
28	Arthritis	L	Staph.	Staph.	Osteomyelitis	Vaccines	C		
32	Arthritis	H	Strep.	.....	None	None	D	3	

Tables showing all cases in which the blood cultures were positive.

Temp: H=temp. over 104°; M=temp. 102°-104°, L=temp. below 102°. Result: D=died, C=recovered, ?=termination unknown. Day: Number signifies days after admission to hospital. Specific Treatment: refers to vaccine or serum therapy and day of beginning treatment.

Of the 9 cured cases *every case but one* was treated with either vaccines or serums. On the other hand, there were two cases treated with vaccines which ended fatally (Cases 23 and 52); one of these cases received only one dose of vaccine and

the other was the case already mentioned which died after operation from brain abscess. The first of these failures cannot speak against vaccine therapy and the effect of the vaccine on the general septicæmia in case 52 was all that could be wished.

Serum alone was given in 7 cases of streptococcic bacteriæmia with three recoveries and four deaths. The writer believes that in some cases the serum was given so late and in such small doses that little could have been expected. Cases rarely reacted favorably to less than 40 c.c. daily and some cases received 100 c.c. or more at a single dose. It may be noted here that antistreptococcic serum loses its complement after it has been kept for some time and when the fresh serum is not obtainable a certain amount of fresh horse serum should be added to each dose.¹⁵ It is said that fresh horse serum complement is better adapted to the antistreptococcic serum than is human complement. The commercial polyvalent serum was used, except in a few of the recent cases in which the serum supplied by the New York City Board of Health was used. Apparently the results in the more recent cases were a little better than the earlier results, either because the serum was fresher, or because of the difference in the character of the serum. Vaccines, either alone or in combination with antistreptococcic serum, were given 7 cases of streptococcus bacteriæmia with 5 recoveries and 2 deaths. Among similar cases, receiving no specific treatment, there were 13 deaths and only one recovery.

Of the staphylococcus cases there were 11 cases and 6 deaths, a general mortality of 55 per cent. Of the cases treated with vaccines there were 4 recoveries and 3 deaths. Among the untreated cases there was only one recovery. This case (No. 62) was treated with colon bacillus vaccine for pyelitis complicating pregnancy, during the course of which she developed a staphylococcus bacteriæmia. Following an induced abortion both conditions improved. In discussing the use of vaccines in the treatment of bacteriæmia such a case should properly be included among the cases *not* receiving vaccines. The case receiving the stock staphylococcus vaccines (Case 33)

left the hospital on the tenth day and received the vaccines while under the care of his own physician. It is included here because the diagnosis is certain, his condition was extremely grave, and a decidedly bad prognosis was given when he left the hospital. In all the staphylococcus cases the staphylococcus aureus was the organism isolated.

Two positive cases of bacillus *aërogenes capsulatus* bacteriæmia occurred, both coming to a fatal issue within twenty-four hours.

The following table gives at a glance the results of the different methods of treatment:

		Cured.	Died.
Streptococcus, (28 cases)	Vaccine treatment	5	2
	Serum treatment	3	4
	No specific treatment	1	13
Staphylococcus, (11 cases)	Vaccine treatment	4	3
	No specific treatment	1	3
Bacillus <i>aërogenes capsulatus</i> (2 cases)		0	2
Total		14	27

Reference should be made here to some of the other methods of treating septicæmia which are advised and which have been used to a considerable extent. Cheyne¹⁶ advises quinine in full doses, together with polyvalent antistreptococcus serum. Watkins² and Young and Williams⁹ advise out-door treatment. Lobenstine¹⁷ has reported the use of intravenous infusions of magnesium sulphate in one case with success. A few years ago formalin was used in some infections of this type, but it was soon discarded as useless.

Credé¹⁸ gives from 2 to 10 c.c. of a two per cent. solution of collargol intravenously. This drug has been quite extensively used, but there is little reference to it in the recent literature except by Wolf,¹⁹ who reports one case cured by means of collargol enemata. Its value is problematic. More recently, especially in Italy and France, considerable praise has been given to mercury in the treatment of general sepsis (Girou,²⁰ Schmidlechner,²¹ Stowe²²). In the few cases I have found in which a proved bacteriæmia was present, the results have been bad. Schmidlechner reports six cases of

streptococcic bacteriaemia treated with mercury in which there was only one recovery.

In all of these methods the object has been the sterilization of the blood by the use of drugs, the so-called chemicotherapy, in contradistinction to the conquest of the infection by methods designed to increase the resistance of the patient, immuno-therapy. While the results of the drug treatment of bacteriaemia have been disappointing heretofore, the remarkable success of Ehrlich's salvarsan in the treatment of syphilis, gives promise of a similar therapy for other general infections.

CONCLUSIONS.

1. Septicæmia with true bacteriaemia is a disease of great severity and of exceedingly high mortality, but, except in the type associated with malignant endocarditis, and in terminal infections, many cases are amenable to treatment.

2. Vaccines are of benefit in many of the cases not overwhelmed at the onset by the severity of the infection, and, clinically, seem to benefit the majority of the cases.

3. Antistreptococcic serum is of great value, especially during the early stage when its bactericidal powers are most pronounced, and if given in sufficient dosage during the period of invasion will often change a systemic bacteriaemia into a localized infection.

4. The combination of antistreptococcic serum, used in the early stage of septicæmia, together with autogenous vaccines, used as soon as they can be prepared from blood cultures, seems to be particularly beneficial. If the blood cultures are sterile, vaccines may be prepared from the local lesion, although this method is unsatisfactory and may lead to errors. Stock vaccines are still less desirable, and are of uncertain value.

5. Neither sera nor vaccines, although they usually do little harm, are free from danger, and the dosage and intervals need to be carefully worked out.

6. Open-air treatment in cases in which cultures are sterile and as an adjunct to vaccine and serum therapy seems to be the best method of increasing the resistance of the patient.

NOTE.—I desire to express my thanks to the attending staff of the Presbyterian Hospital for permission to publish these reports and especially to Dr. Ellsworth Eliot, Jr., for his advice and criticism in the preparation of this paper.

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THE ADVANTAGES OF THE DOUBLE RESECTION IN CERTAIN TYPES OF GOITER.

BY DONALD C. BALFOUR, M.D.,

OF ROCHESTER, MINNESOTA.

(From the Mayo Clinic.)

THE surgery of the non-toxic and non-malignant enlarged thyroid at the present time is attended by practically no mortality. That this fact is known to the laity is evidenced by the increasing frequency of operations on the thyroid by surgeons who are attaining good results, both immediate and ultimate. Realizing, then, that the development of the operative treatment of the thyroid has made safe, in so far as life is concerned, the removal of the so-called simple goiter, further advancement must be made in refinement of technic, in lessening the possibilities of complications, in improving the end-results, and in obviating, as much as possible, recurrence of the condition.

Patients with thyroid enlargement without any evidence of toxæmia attributable to the goiter usually desire its removal only for mechanical and cosmetic reasons—that is, pressure and deformity. It is in this group that not only is safety imperative, but also an operation which will offer the patient the greatest probability of permanent relief. With this in mind, I wish to describe a type of operation which, while not original in this clinic—it being but a modification of the Mikulicz resection—is being used more and more frequently and with most satisfactory results. The operation is performed as follows:

The usual low-collar incision is made, the external jugular vein marking the limits of the incision laterally. The subcutaneous tissue and platysma are then reflected, the upper flap as high as the thyroid cartilage, the lower flap to the sternal notch. The vertical muscles, sternohyoid and sternothyroid of one side are then separated from those of the opposite side by dividing in the midline, from the thyroid cartilage to just above the sternal notch. The thin peritoneum-like fibrous covering of the gland will then be exposed and this should be freed over the front of both lobes.

The finger is then inserted under this capsule and the entire gland carefully explored to determine the size of the lobes, the relations of the trachea, and the presence of any substernal, retrotracheal or other isolated portion of gland.

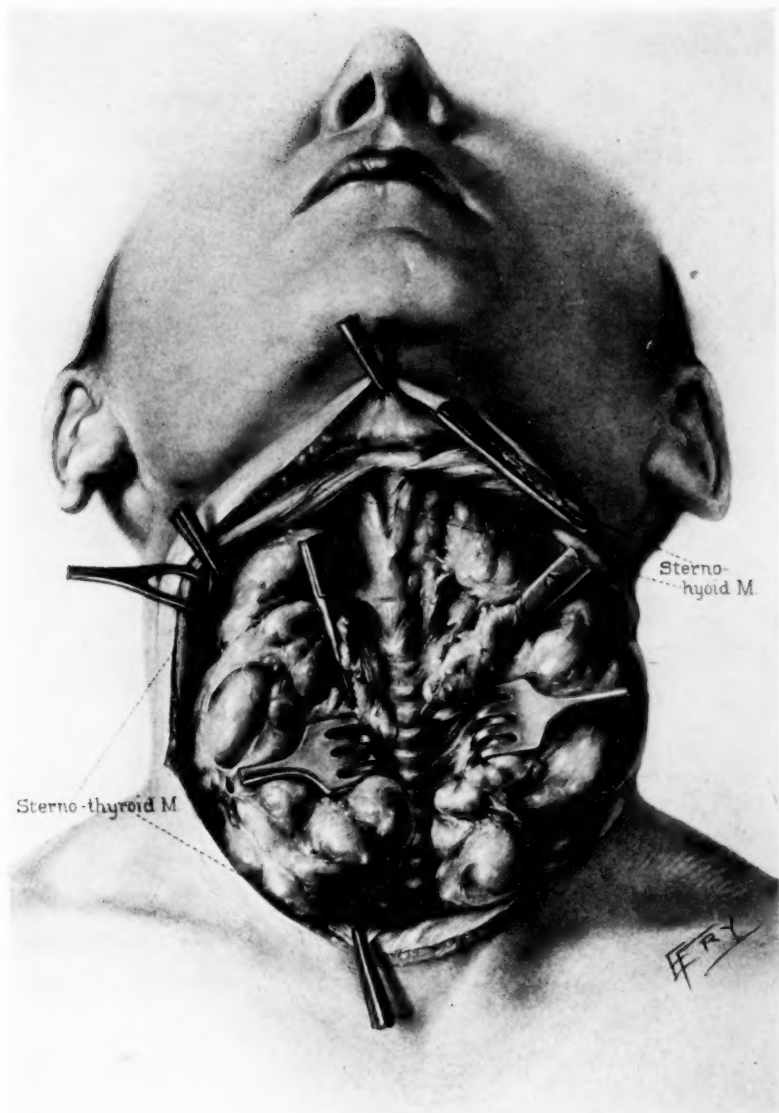
It is now possible to decide upon what should be the further operative procedure. If the exploration reveals a single encapsulated adenoma or cyst in one lobe with an apparently normal lobe on the opposite side, extirpation of the involved lobe or enucleation of the tumor with division of the isthmus is usually sufficient. If, however, as is so much more frequently found, both lobes are involved in the same process, that is, a diffuse colloid condition, or multiple adenomata of various sizes, we believe the removal of the diseased portion of each lobe is the operation of choice. As a preliminary step, it is often possible to dislocate both lobes from their positions by careful finger-manipulation, after freeing any lateral or accessory veins. In this manner the entire gland in many cases can be traced to a situation as shown in Fig. 1.

It is immediately obvious in a large percentage of cases that removal of the larger lobe will be inefficient in relieving both pressure and deformity, and offers considerable possibility of recurrence of the trouble not only by later enlargement of the remaining lobe, but also because of the retraction beyond even the natural contour of the normal neck which may take place on the side from which the lobe has been removed. A double resection, therefore, in this group of cases seems to be the ideal procedure and is being more and more frequently employed by us. During 1913, of 1569 operations on patients with various types of goiters, 783 were of the non-toxic or non-exophthalmic type, 583 of which were for so-called multiple or diffuse colloid adenomas. In this latter group of patients, 295, or 55 per cent., were operated on by the double resection method, 116 (21.7 per cent.) had an extirpation of one lobe and isthmus, 122 (23 per cent.) had extirpation of one lobe, isthmus and part of the other lobe.

Both lobes are dislocated if possible. In doing this completely one often finds that one or both lobes have a tendency to become flattened out and extend behind the trachea so that this structure is frequently entirely surrounded by the thyroid tissue. By careful traction the entire lobe of each side can be exposed, and by inspection it can be determined what portion of each should be removed in order to obtain a good end-result.

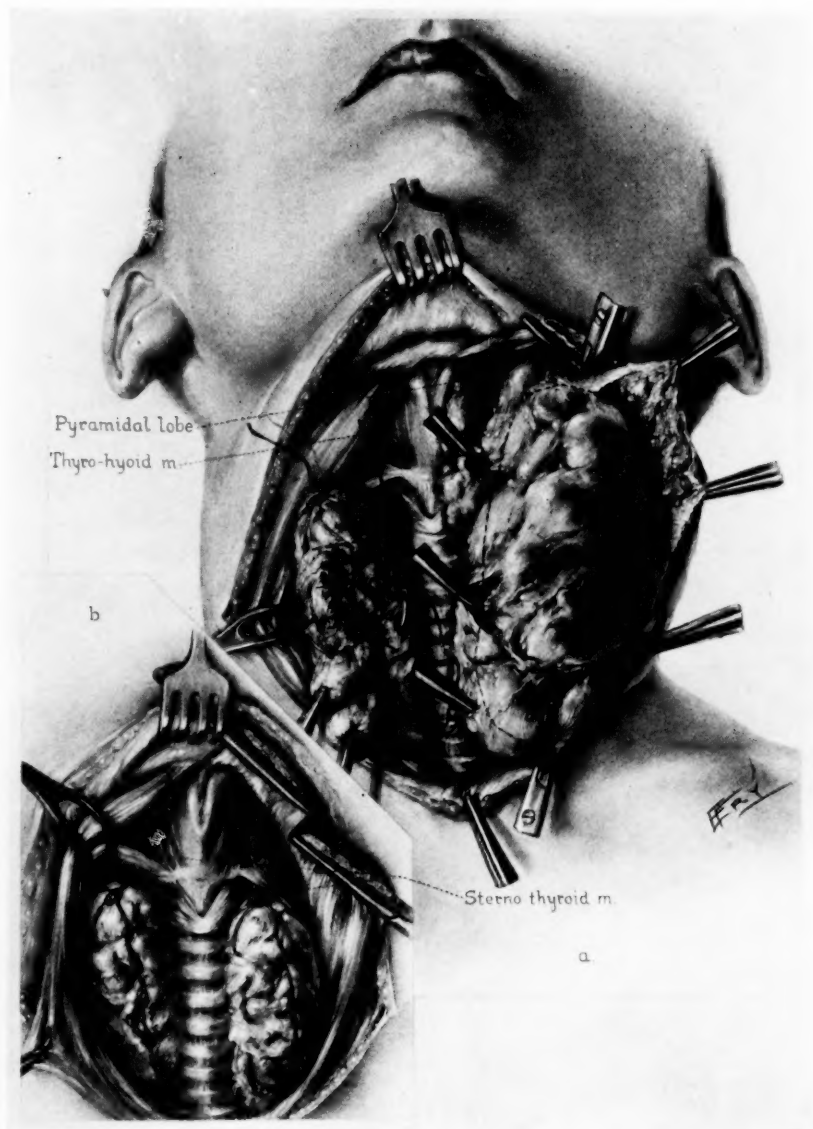
The first step in the actual removal consists of a division of the isthmus. This in some cases entails considerable oozing, especially when the structure is of any thickness, but in the majority of cases, if the operation is done with care and an effort made to find the narrowest part, little difficulty will be encountered. In some cases the isthmus can be lifted from the trachea, two forceps clamped entirely across, and complete division made between these. The segment of isthmus of one side is then freed from any further attachment to the trachea and by steady traction and careful dissection the lobe on that side is freed from the trachea anteriorly and laterally sufficiently to relieve all pressure and to permit of satisfactory suturing after the resection. The other half of isthmus and the opposite lobe are then freed in the same way, disclosing the arrangement of the parts shown in Fig. 2.

FIG. 1.



Both lobes have been freed from their accessory veins and the isthmus divided between forceps.

FIG. 2.



a (left lobe), shows controlling forceps placed and resection of lobe begun. Right lobe resected, with running mattress suture being placed. *b*, shows the relationship of the built-up remnants of the gland.

Either lobe is now resected. The following has been found a convenient and safe method. A series of Ochsner forceps are applied somewhat as follows: One at the superior pole, as a rule about an inch from the upper extremity, one at the inferior pole, three or four laterally, placed on the larger vessels in the capsule and two or three on the tracheal side. These forceps appropriately placed serve the joint purpose of marking the limitations of the resection and of enabling one to control hemorrhage by traction on them along with support of the lobe from behind with the finger. The lobe is then encircled with an incision through the capsule just above the forceps. The resection is then made by "wedging" out the interior of the gland. In practically all multiple adenomas the colloid masses will separate easily from the healthy gland by finger enucleation. In the diffuse colloid glands without tumors the proper portion to resect is readily determined. Having completed this there will be remaining the superior pole, the entire posterior capsule with a layer of gland-tissue and oftentimes the inferior pole, so that the portion of the gland most closely approaching the normal has been retained. This cup-shaped structure is now rebuilt into a compact strip of gland-tissue by suture. We have found the following method of suturing very satisfactory: Starting at either pole, a continuous mattress suture of plain catgut from outer to inner capsule is inserted behind the line of forceps originally placed on the capsule and continued to the other extremity of the lobe. This controls practically all the bleeding and obliterates the cavity in the centre of the lobe. The same suture, returning in an opposite direction, by a locking or button-hole stitch catches the edge of the capsule and rolls the two edges together into some semblance to a normal lobe. This reconstructed lobe is then allowed to drop back into the space formerly occupied by the enlarged gland. The opposite side is treated in the same way, resecting as much as seems necessary.

The proper amount of thyroid to be left cannot be stated in actual figures. In no case in which this method of resection has been used has there been any evidence of too much thyroid having been removed.

The difficulties of this type of operation become less with increasing experience, and I believe are more than compensated for by the distinct advantages obtained. In the first place, the operation is eminently safe in all respects. Control of hemorrhage is more certain, if possible, by suture than by ligation. Danger of injury to the recurrent laryngeal nerve is greatly minimized and can hardly occur if the operation is properly performed. Free dissection of the gland from the trachea is permissible and gives an opportunity for much easier and efficient control of bleeding by suturing from internal to external capsule. The fact that the superior and inferior poles and the entire posterior part of capsule are retained precludes

any possibility of removal, injury or interference with the circulation of the parathyroids. This operation is of particular value in treating large goiters which by long continued pressure on the trachea have caused a softening of the rings. In these cases a temporary tracheal collapse sometimes occurs when the pressure on one side is relieved and the surgeon is in an awkward predicament under such circumstances, if the trachea is not quickly available. By this method the exposure of the trachea as a first step gives immediate and continuous control of the situation.

The benefits to the patient from this type of operation are well defined. All sense of pressure is relieved, and the neck is made quite symmetrical, which cannot be said of some of the cases in which an entire lobe has been removed and the opposite lobe left untouched. After such an operation one can assure the patient that there will be much less liability of recurrence of the goiter than with any other type of operation.

The cases to which this operation is applicable are in general the diffuse colloid adenomas. It is not necessary, of course, in the single cystic thyroid, where the trouble is due to an isolated tumor in the gland. It has a very limited field in the exophthalmic group where symmetry is a secondary consideration and the patient is operated for relief of symptoms only.

THE FREQUENCY OF CARCINOMA OF THE APPENDIX.

A REPORT OF 40 CASES (.44 PER CENT.) IN 8039 SPECIMENS.

BY WM. CARPENTER MacCARTY, M.D.,

AND

BERNARD FRANCIS McGRATH, M.D.,

OF ROCHESTER, MINNESOTA.

(From the Mayo Clinic.)

THE frequency with which carcinoma of the appendix occurred in the surgical material of the Mayo Clinic during a routine examination of appendices which had been removed primarily or secondarily has stimulated the writers to investigate further the regularity and frequency of its occurrence. In a previous report¹ 22 specimens which presented histological pictures of carcinoma occur in 5000 specimens. Only five of these were large enough to be suspected at operation. The remaining 17 were discovered only upon making routine gross serial sections. The neoplasm was not visible upon the external surface and occurred always in appendices in which the lumen had been partially or completely obliterated.

In the published series the condition occurred in the following frequency:

- 5 ($\frac{1}{2}$ per cent.) in the first 1000.
- 7 ($\frac{7}{10}$ per cent.) in the second 1000.
- 3 ($\frac{3}{10}$ per cent.) in the third 1000.
- 2 ($\frac{2}{10}$ per cent.) in the fourth 1000.
- 5 ($\frac{1}{2}$ per cent.) in the fifth 1000.

The youngest (five years) occurred in a female who was operated upon for appendicitis. The average age was thirty

¹ MacCarty and McGrath: Clinical and Pathological Significance of Obliteration, Carcinoma and Diverticulum of the Appendix. *Surgery, Gynecology and Obstetrics*, March, 1911.

TABLE OF CASES.

Hosp. No.	Age	Sex	Duration of symptoms.	Location of pain.	Fever.	Vomiting.	Jaundice.	Condition found.
28043	26	F	4 yrs.	Rt. iliac region	+			Chronic appendicitis.
28359	50	F	15 yrs.	Umbilical region, rt. iliac region				Chronic appendicitis. Tumor on end of appendix carcinoma.
26527	25	F	4 yrs.	Epigastrium				Chronic cystic appendicitis.
			3 yrs.	Rt. iliac region				Cirrhosis of liver. Carcinoma at base of appendix.
18030	33	M	2 yrs.	Abdomen (gen.), rt. iliac region	+	+		Subacute appendicitis. Carcinoma of tip of appendix.
17259	20	F	Several yrs.	Rt. iliac region				Chronic appendicitis.
31005	23	F	8 yrs.	Rt. iliac region to back	+	+		Chronic appendicitis.
25862	30	M	1 yr.	Abdomen (gen.), rt. iliac region	+	+		Chronic appendicitis. Gall-bladder thickened.
31023	37	F	4 yrs.	Umbilical region, rt. iliac region	+	+		Chronic appendicitis.
31326	26	F	8 yrs.	Rt. nypochondrium, rt. iliac region	+	+		Chronic appendicitis.
31679	5	F	Since birth			+		Chronic appendicitis. Enlarged glands in the mesentery.
32898	22	F	8 mos.	Rt. iliac region	+	+		Chronic appendicitis.
29613	27	F	7 wks.	Rt. iliac region, rt. hypochondrium			+	Chronic appendicitis (adherent).
24497	42	M	3 mos.	Epigastrium				Right inguinal hernia. Chronic appendicitis.
34532	80	M	10 yrs.					Four stones in urinary bladder.
A33079		F						Subacute appendicitis. Cholelithiasis.
32682	34	F	4 mos.	Rt. iliac region				Endometritis and uterine fibroids. Appendicitis, Carcinoma of the tip of the appendix.
31580	16	F	2 yrs.	Rt. iliac region		+		Acute appendicitis.
			10 das.	Rt. iliac region				Acute appendicitis. Small abscess in omentum.
21362	29	M	11 yrs.	Rt. iliac region	+	+		
23043	26	P	2 yrs.	Rt. hypochondrium	+	+	+	
*Carc. A								
*Carc. B								
*Carc. C								

* Labels blurred or lost.

CARCINOMA OF THE APPENDIX.

677

43694	22	F	6 mos.	Epigastrium				Carcinoma of appendix.
43933	44	M	15 yrs.	Epigastrium				Chronic catarrhal cholecystitis. Chronic pericholecystitis. Chronic catarrhal appendicitis with stenosis of canal in distal one-third. Carcinoma at tip.
44138	10	M	9 mo.	Lower lt. quadrant			+	Chronic catarrhal appendicitis with carcinoma developing on area of stenosis at middle and causing atresia of canal.
44170	37	F	5 yrs.	Lower abdomen				Bilateral chronic suppurative salpingo-oöphoritis. Very early carcinoma of appendix.
44255	36	F	5 yrs.	Epigastrium, rt. iliac fossa				Colloid carcinoma of appendix.
44537	27	F	11 yrs.	Epigastrium			+	Adenomyoma of uterus. Chronic catarrhal appendicitis with carcinoma at tip.
45406	31	F	11 yrs.	Epigastrium			+	Carcinoma of appendix. Chronic catarrhal cholecystitis. Cholelithiasis.
45446	39	F	8 yrs.	Rt. iliac fossa				Carcinoma of appendix. Umbilical hernia.
47148	22	M	2 yrs.	Rt. iliac fossa				Chronic catarrhal appendicitis with carcinoma at tip.
48430	17	F	8½ mos.	Rt. iliac fossa			+	Carcinoma. Chronic catarrhal appendicitis with obliteration of distal one-third.
48074	27	M	4 yrs.	Epigastrium				Carcinoma 5 mm. from tip of appendix.
49974	30	M	7 yrs.	Epigastrium			+	Chronic catarrhal appendicitis with carcinoma at tip.
49976	28	F	3 yrs.	Rt. iliac fossa			+	Small hemorrhagic fibromyoma. Chronic catarrhal appendicitis with carcinoma at tip.
50920	10	F	4 yrs.	Rt. iliac fossa		+		Chronic catarrhal appendicitis with carcinoma at tip.
51904	34	M	4 das.	Under rt. costal arch				Carcinoma.
52076	32	F	2 mos.	Rt. iliac fossa			+	Bilateral chronic salpingitis and oöphoritis. Carcinoma of appendix.
53526	26	F	19 yrs.	Abdomen			+	Carcinoma of distal end and pigmentation of mucosa of proximal one-half.
54098	44	F	7 mos.	Rt. of umbilicus				Bilateral chronic salpingitis. Simple ovarian cyst. Chronic catarrhal appendicitis with obliteration of mucosa at tip. Carcinoma at tip.

years. Seventy-three per cent. were females. Ninety per cent. occurred near the tip of the appendix.

It was found that the average duration of symptoms was 3.3 years. One in every 225 of all appendices in the series and one in every 53 partially or completely obliterated appendices were carcinomatous. Thirty-one per cent. was found in association with other abdominal and pelvic conditions.

Since these findings were made, 3039 specimens which were removed between November 15, 1911, and July 1, 1913, have been examined immediately upon removal. In this later series 18 (6/10 per cent.) were carcinomatous. In all specimens the lesion occurred at or near the tip and in a portion, the lumen of which had been obliterated. In none of these was there any gross evidence of the condition at operation. The findings were only made upon careful examination in the surgical laboratory. The lesion itself consisted of islands or masses of epithelial cells, which were scattered throughout the submucosa, muscularis and subserosa (Figs. 1 and 2).

The nuclei presented the irregularities which are characteristic of carcinomatous cells (Fig. 2).

The present interest which stimulated this report rests upon a desire on the part of the investigators to learn something about the clinical significance of the condition.

In none of the cases herewith presented was there any fact which pointed to clinical importance. However, the mere fact that such a condition is comparatively frequent and, indeed, rather a constant finding is significant enough to warrant closer study of the appendix in view of the possibility of more extensive changes.

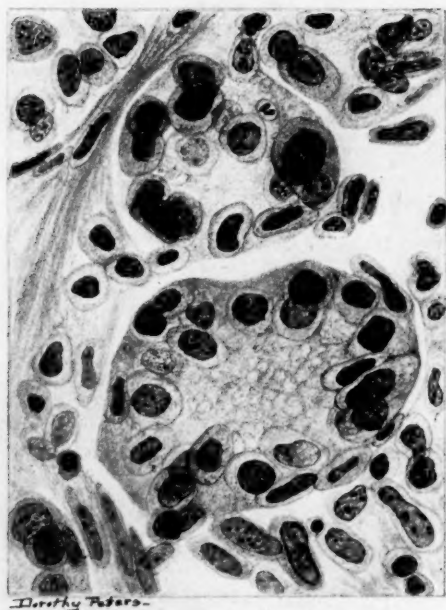
Surgeons and pathologists are therefore urged to closely examine all such cases and note the presence of metastases if such occur.

FIG. I.



No. 31005. Involvement of the submucosa and the musculature by carcinoma.

FIG. 2.



No. 31005. Showing the irregular character of the nuclei in early carcinoma of the appendix.

A CONSIDERATION OF CERTAIN COEXISTING LESIONS OF THE GALL-BLADDER AND KIDNEY.*

BY ELLSWORTH ELIOT, JR., M.D.,

OF NEW YORK,

Surgeon to the Presbyterian Hospital.

THE clinical features of a given lesion vary least in uncomplicated lesions of single organs. While, even in cases of this kind, the symptoms may prove so exceptional as to make diagnosis difficult, this difficulty is still further increased and becomes more common when more than one organ is involved. If, in this way, the lesion is multiple, a distinction must be made between those cases in which other organs gradually become involved by an extension of the primary lesion, as for example, the metastases of malignant growths, those cases in which multiple lesions, occurring simultaneously or in sequence but independently, are probably due to a common cause or diathesis, as for example, certain multiple benign neoplasms such as lipoma, those cases in which the lesions as well as their associated clinical features are considerably modified either by the consecutive development or by the coexistence of two or more individual agents of infection, and finally, those cases in which the actual diagnosis is greatly obscured by the coexistence of two or more entirely separate and independent lesions in organs lying in juxtaposition, in any one of which, when occurring singly, no special difficulty in diagnosis would be encountered.

In cases of multiple lesions in which secondary lesions develop, or in those cases in which all lesions irrespective of the time of their appearance, may be ascribed to a common cause, clinical observation and research, extended over many centuries, has standardized and facilitated the methods of diag-

* Read before the New York Surgical Society, January 14, 1914.

nosis and has diminished the frequency of error. On the other hand, the study of the modification of any special lesion by either some form of pre-existing infection or *vice versa*, is still in a stage of early investigation. Thus, for example, what change if any could be expected in tubercular cervical lymph-nodes in the event of syphilitic infection, or does syphilitic infection modify either the lesion or the clinical course of pre-existing malignant disease?

It is, however, to the last group of cases, in which the diagnosis is obscured by the coexistence of two or more entirely distinct lesions in adjacent organs, that the writer wishes to call attention and as the field is necessarily a broad one, the scope of inquiry will be limited to the consideration of coexisting lesions of the right kidney and gall-bladder.

Coexisting lesions of these organs, the result of trauma, are necessarily simultaneous. This is equally true of subcutaneous rupture as well as of penetrating wounds. In cases of the latter character the clinical picture is of interest in that symptoms arising from injury to one viscus may be partially or completely obscured by those arising from injury to the other. The uncertainty of diagnosis may be still further increased by the involvement of additional adjacent viscera and the actual nature and extent of the injuries may be ascertained only after making an exploratory incision. In the case of the kidney, while subcutaneous rupture is usually limited to that organ, its close relation to adjacent viscera accounts for the fact that, in penetrating wounds, one or more of these structures are injured as well. In a careful search of the literature 25 cases of pistol shot wound of the kidney were collected in a majority of which some additional viscus had been torn or penetrated. These included the pleura and diaphragm, the cardiac end and other parts of the stomach, the duodenum, the ileum, the colon, the splenic vessels and of the solid viscera, the pancreas and the liver. That the gall-bladder ordinarily escapes is not surprising in view of its protection by the liver, the costal margin, its considerable mobility, and its usually flaccid condition. While several cases of penetrating wound

of the gall-bladder have been reported, no mention of a simultaneous penetration of this organ and of the right kidney has been made.

In the case herewith reported there was no suspicion of damage to the gall-bladder prior to the discovery of a large amount of bile in the peritoneal cavity. Examination then showed two orifices near its fundus through which the bullet had entered and had left that viscus. On the other hand, the previous withdrawal of blood and urine through the catheter indicated a laceration of some part of the urinary tract above the bladder, and further search disclosed an extensively torn right kidney invested in a large retroperitoneal hæmatoma. The subsequent careful routine examination, so important in all penetrating wounds of the abdomen, revealed only a grazing of the hepatic flexure of the colon without penetration of its cavity.

The treatment of penetrating wounds of the kidney has been both conservative and radical. Of the sixteen cases reported by Clémens three were treated expectantly with one recovery and two deaths. In the case that recovered the diagnosis was made by the presence of a punctured wound in the lumbar region associated with hæmaturia; in the two cases that died the damaged kidney was found on autopsy. In one of these cases the peritoneal cavity was found filled with clots, death having followed a sudden effort three days after the injury had been received, during which time the patient's general condition had been excellent. This same clinical course has occurred in rupture of other viscera, notably of the liver and spleen and one instance of rupture of the ileum without hemorrhage was reported by the writer some years ago. Such unfortunate accidents in connection with traumatic conditions of the abdomen point very strongly the moral that immediate exploration is warranted when the physical signs indicate the possibility of rupture, even though the general condition of the patient is such as not to excite apprehension.

Of the remaining 13 cases five were treated by tampon, in three of which the kidney perforation was the sole lesion;

while in the remaining two, one was complicated by a wound of the diaphragm and pleura and the other by two perforations of the duodenum and ileum which were sutured. All five cases recovered. In two other cases the kidney laceration was treated by suture. Both of these were complicated by a wound of the liver and in one the colon was perforated as well. The last mentioned case recovered, the former died. The remaining 6 cases were treated by nephrectomy: of these, two were without complications, with one recovery and one death, and four were complicated with wounds or perforations of other viscera. Of these, two recovered and two died. Taking the 16 cases together, 10 recovered and 6 died, recovery being largely favored by prompt interference.

While the total number of cases is entirely inadequate to serve as a basis for the formulation of the most desirable method of treatment, the advisability of exploration should at least be emphasized. If the bullet has entered the anterior abdominal wall this warning, for reasons already stated, is superfluous. In no instance would conservatism be warranted. If, on the other hand, the bullet has penetrated the lumbar region, the exposure of the kidney can be made with little risk and can be followed by nephrectomy when the kidney tissue or its pedicle is badly torn, or by tampon or suture when the laceration is not extensive. The ascending colon can then be examined and any perforation, if such exist, may be closed. If the bullet has penetrated the peritoneal cavity, further exploration and all necessary treatment is preferably made through an anterior incision.

In a search of the literature no cases of coexisting penetrating wounds of the gall-bladder and kidney were found. Two cases, however, have been reported by Frank and Wiewiorowski respectively, in which the gall-bladder had been penetrated by a bullet. In Frank's case no other lesion was found, while in Wiewiorowski's case there was, in addition, an orifice in and near the anterior border of the liver. Both of these cases are of interest in that they show that pronounced symptoms may be expected in penetrating wounds of the gall-

bladder even though no other viscus is involved and they illustrate as well an interesting method of dealing with the perforation. Brief abstracts of these cases follow.

Frank's Case.—Location of wound one and a half inches below and one inch to the right of the ensiform. Bullet felt under the skin opposite the middle of the eleventh rib which it had fractured. The patient was in moderate collapse and had several attacks of hæmatemesis. The peritoneal cavity opened through a three inch vertical incision just to the left of the median line, and was filled with blood which seemed to come especially from the region of the gall-bladder. This organ was situated nearer than usual to the median line and presented in the line of the incision. A perforation near its fundus, bleeding freely, was closed with silk and reinforced with Lembert sutures. After the removal of the blood the abdomen was closed without drainage. Recovery.

Wiewiorowski's Case.—Location of the wound beneath the costal margin in the mammary line. The symptoms included pain, rigidity, weak pulse and shallow respiration. Peritoneal cavity opened 7 hours after the accident contained much bile. A hole 3 cm. from the anterior border of the liver and a large perforation on the under side of the gall-bladder were closed, each with two sutures. Drainage for 8 days. Wound completely healed on the twelfth day. Recovery.

The closure of the perforation in both cases is in marked contrast to the cholecystectomy which treatment was adopted by the writer. In the case herewith reported the two openings in the fundus of the bladder were about one inch apart and could have been separately sutured or a satisfactory cholecystostomy could have been easily established. Which method of treatment is preferable cannot be determined, but at all events it is well to remember that if the condition of the patient requires haste, the simple closure of the perforation has given satisfactory results.

The report of the writer's case herewith follows with mere mention of the fact that there were no symptoms prior to the opening of the peritoneal cavity that suggested the damage to the gall-bladder. The symptoms of peritoneal irritation would naturally appear after any penetration of that cavity with no visceral involvement.

Male, twenty-five. Shot at 4 A.M. with a pistol of medium calibre, and brought to the Gouverneur Hospital. Examination revealed a small circular orifice in the upper right quadrant about

one inch below the costal margin near the outer margin of the rectus muscle. There was marked hæmaturia together with the symptoms of peritoneal irritation both anteriorly and in the right flank. Four hours afterward, an opening along the margin of the right rectus disclosed a large amount of bile in the peritoneal cavity. The gall-bladder was very small, of healthy appearance, and presented near its fundus two openings through which the bullet had passed. The hepatic flexure of the colon was grazed. The right kidney was extensively lacerated and bleeding into both the peritoneal cavity and the retroperitoneal space. The gall-bladder and right kidney were removed and the abdomen closed tightly around a cigarette drain. Convalescence was complicated by suppuration in the perinephritic tissue which quickly yielded to a counteropening. Three years after the accident, the patient was in excellent condition.

Since the publication of Clémens' article, cases have been reported, several rather incompletely, by Wilson, Thorne, Walker, Küster, and Keuper. In Wilson's report of 26 cases of gun-shot wounds of the abdomen, the kidney was injured in one instance, recovery ensuing. In Thorne's case the bullet entering anteriorly, penetrated the greater curvature of the stomach and the upper pole of the left kidney. The perforation of the stomach was closed and the peritoneum over the damaged kidney was sutured. This patient also recovered. Küster reports three cases, all of which were treated conservatively. In the first the diagnosis was made by bloody urine persisting for 8 days after a bullet wound in the lumbar region which healed in 6 weeks; in the second the penetration of the bullet from the left hip to the right kidney region was followed by a urinary fistula which rapidly closed; in the third case an autopsy two and a half months after death from infection showed a healed wound in the convex border of the right kidney with the bullet in the liver. This case was said to have run its course without any symptom pointing to an injured kidney. In Walker's case, the bullet entering the right lumbar region passed through the lower pole of the right kidney and perforated the mesentery, filling the peritoneal cavity with blood. The kidney was sutured and the wound drained posteriorly. The patient made a tedious convalescence.

In Keuper's case, the bullet, entering the left mammary line below the costal border, penetrated the left kidney and the splenic vessel, which was badly torn and surrounded by an extensive hæmatoma. The kidney was removed and the damage to the splenic vessels necessitated also the sacrifice of the spleen. Drainage of both kidney and splenic areas, healing taking place by primary union.

Keuper's case is of special interest from the fact that prompt recovery followed a simultaneous splenectomy and

nephrectomy. The damage to two such vascular organs must have caused very considerable hemorrhage and have diminished, relatively, the resistance of the patient.

Through the courtesy of Drs. Dennis and Keyes, the writer adds brief extracts of cases of gunshot wound of the kidney which were treated by these surgeons in St. Vincent's Hospital.

(1) Man of twenty, shot in the back and right hip and elbow. There was hæmaturia for five days. Owing to a rather rapid fall in blood-pressure after the accident, no operation was performed. The patient made a good recovery. (2) A second case in which the kidney and stomach were penetrated by a bullet. Through a median laparotomy, the stomach was sutured. No nephrectomy was necessary. This patient also recovered.

The consideration of coexisting lesions of the kidney and gall-bladder of a non-traumatic origin deals with an entirely different pathological group, in that the changes that occur in either organ are probably entirely independent of each other and do not develop simultaneously. This leads to a confusing intermingling of subjective and objective symptoms, for while a distended gall-bladder is usually easily differentiated from an enlarged kidney, the coexistence of both conditions may modify the physical signs to such an extent as to make diagnosis extremely difficult. Furthermore, this difficulty may be still further increased, especially in women, by the presence of a "Riedel" modification of the right lobe of the liver.

The history that follows illustrates the possibility of error in diagnosis in coexisting lesions of these organs and emphasizes the importance of exploration in all doubtful abdominal cases even though the chances of benefit from such a procedure may be slight.

E. F., female; admitted to the service of Dr. Thatcher, May 10, 1912. Past history negative. Patient was always well until 6 months ago when she suffered from attacks of epigastric pain of a heavy, dull character, situated in the middle of the line and not affected either by respiration or by raising of the shoulders. This pain came on directly after eating, lasting from one to two hours and relieved by taking hot water. Occasionally the pain

was intensified by movement from side to side. Neither during nor after cessation of the pain was any tenderness noticed. Shortly after the advent of the pain, patient suffered from attacks of coughing with the raising of small amounts of blood. There was no actual vomiting and the blood did not appear until some time after the coughing was first noticed. Four months ago, after the appearance of both the cough and the bloody expectoration, patient is said to have had an attack of pleuropneumonia and it was owing to the slow convalescence from this illness that she was recommended to the hospital for treatment. During this time as well as after her admission to the hospital patient suffered from a continuation of the epigastric pain and the persistent coughing, which together with a tendency to faint when getting out of bed, constituted her chief complaints. There has never been any symptom pointing to disturbance of the urinary tract. During the 6 months prior to her admission in the hospital patient has lost about 60 pounds.

Examination shows in the midline a rounded tumor, extending below to within one-half an inch of the umbilicus while its upper limit is not well-defined. Its surface is smooth, its consistency is firm and in its widest diameter is about four inches. It is slightly movable with respiration and from side to side. At the time of the first examination the right kidney was not "palpable," but later this organ could be made out. A clinical diagnosis of carcinoma, probably of the stomach, was made. This diagnosis seemed to be substantiated by the findings in the stomach. This organ contained a large amount of thick tenacious mucus and was cleaned with difficulty. There was no macroscopic blood. The analysis of the gastric contents showed a total acidity of .036 per cent., an absence of free hydrochloric acid, no lactic acid and a moderate reaction showing the presence of blood. A second analysis several days later yielded a similar result.

Routine examination of the urine showed a large amount of pus. This led to an investigation of the bladder by Dr. Osgood and it was found, that while the urine from the left kidney was normal, that from the right was very scanty and almost entirely purulent. An X-ray then taken disclosed the presence of a large calculus in the right kidney.

On subsequent examination the mass seemed to extend into the right hypochondrium and back toward the lumbar region, and

it was thought that the line of demarcation between it and the kidney could be demonstrated.

The patient was anæmic, the general leucocytosis was 18,000, with a polymorphonuclear count of 79 per cent. A Wassermann reaction was negative.

During the next four weeks the patient ran an irregular temperature with evening exacerbations. While it was realized that under ordinary circumstances the calculus, together with the remnant of the right kidney should be removed, the propriety of this measure was questioned, in view of the fact that the patient, if suffering from extensive malignant disease, could scarcely hope for any permanent relief. Four weeks after admission to the medical ward, having been seen several times by the surgeon in consultation, she was transferred to the surgical side for operation which, in view of the doubtful diagnosis, seemed to be warranted. On examination at this time, it was realized that a part of the mass at least was due to the condition of the kidney but that a considerable portion situated more anteriorly could not be accounted for in this way.

Operation.—Ether. The kidney was exposed through the lumbar route and was found to be extensively adherent to the investing perirenal fat. It was markedly lobulated, measuring 17 by 19 by 7 cm., its capsule non-adherent, its denuded surface finely granular. It presented multiple abscesses with a moderately distended pelvis which contained a large branched calculus extending into the dilated calices. There were several other calculi nearer the periphery of the organ. Microscopical examination showed a chronic suppurative nephritis with a calculous pyonephrosis (made by Dr. A. V. Whipple). The kidney was removed, the pedicle being divided between clamps to avoid soiling of the operative field. The peritoneal cavity was then opened along the outer margin of the colon. This permitted a thorough exploration of the region of the pylorus, the duodenum and the gall-bladder. This last-mentioned organ was found to be greatly distended and enlarged, and was presumably the site of a chronic cholecystitis. The pylorus, the adjacent part of the stomach, and the duodenum were normal. The peritoneal cavity was now sutured and the lumbar incision closed in the usual way with drainage. The patient made a prompt recovery but has hitherto refused to submit to

operation for the distended gall-bladder which was felt unchanged 6 months after operation. She left the hospital.

Post-operative Notes.—Five months after operation, patient was in very good condition. Both the pain and the cough had disappeared and she had regained some of her lost weight. The gall-bladder was still palpable, as at the time of her discharge from the hospital, but was not sensitive. Nineteen months after the operation patient had regained all her lost weight and was able to eat all kinds of food. She has never felt so well during the past five years as at present. On examination, the gall-bladder can no longer be felt. In its place there is a slight sense of resistance and the patient states that the only indication of the former trouble is the occurrence of slight occasional cramps in the gall-bladder region.

The most careful consideration of the history of this patient fails to disclose any symptom which could be ascribed to the condition of the gall-bladder. Therefore, it is impossible to say which lesion was primary. The changes in either organ indicated lesions of long standing. That the symptoms, of which the patient complained, were due to the renal calculus, is clearly demonstrated by their prompt and permanent disappearance when the kidney was removed. Even the pain, which in its location was much more significant of cholelithiasis than of a kidney stone, completely vanished. That in renal calculus, the pain is sometimes referred anteriorly, must be recognized by all. The writer some years ago called attention to this fact and cited instances of the occurrence of pain from renal stones anteriorly below the level of the navel and on the affected side. The present case is the first instance that he has observed of pain from the cause referred anteriorly to an area above the level of the navel, and, what is still more unusual, as pronounced on one side as on the other.

The fact that the patient lost over 50 pounds within six months is, at her time of life, suggestive of malignancy. In her case, it was probably the result of her prolonged illness and of the associated "hectic" temperature. The diagnosis of cancer of the pylorus seemed plausible in view of the location of the tumor and of the results of the gastric analyses.

Had this condition actually existed, the size of the tumor would have indicated that it had probably reached an inoperable stage, in which event the removal of the calculus would have been of little value. On the other hand, in the absence of malignant disease, the removal of the calculus was clearly indicated. The fortunate intervention, carried out only after an exhaustive observation of the patient, must be ascribed to the fact that the physical signs were so obscure and in a measure so contradictory that only an exploration could unravel the mystery.

The fact that, at present, 19 months after the operation, the gall-bladder is no longer palpable, raises the question of whether the lesions of these two organs were accidental or whether, as a matter of fact, the gradual enlargement of the gall-bladder might not have resulted from the irritation due to the elimination of toxins arising from the chronic pyonephrosis. At the time of operation the condition of the gall-bladder seemed to justify a secondary cholecystectomy or cholecystostomy and the patient was so advised. The advice was repeated when, at the end of five months, the gall-bladder remained unchanged. At present, however, the fact that the gall-bladder can no longer be felt, seems to have rendered a second operation unnecessary unless there should be some subsequent exacerbation.

In conclusion the writer wishes to urge, in all doubtful conditions of the abdomen, the propriety of surgical exploration if by such means there is a chance, no matter how slight, of benefit to the patient.

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SPLENIC ANÆMIA WITH SPLENECTOMY (BANTI'S DISEASE).

A CASE REPORT, WITH REMARKS.

BY FREDERICK C. HERRICK, M.D.,

OF CLEVELAND, O.,

Associate in Surgery in the Western Reserve University.

THE designation, Banti's disease, was made because beginning about 1883 a Florentine pathologist by that name made successive reports of a condition in which he found primary enlargement of the spleen with accompanying anæmia followed by cirrhosis and ascites. To this complete symptom complex the name was applied by Senator.¹ Although primary splenic enlargement with anæmia, but without known etiology, had been observed to occur, yet its causative action in the anæmia and hepatic cirrhosis was first conceived by Banti.

Previous to this several authors had suggested sub-division of the leukæmias, so that Banti's suggestion met with quite general approval. Since his work it has been definitely further agreed that there is a group of conditions between the leukæmias on the one hand and the cirrhoses of the liver on the other, possessing some of the peculiarities of both conditions, yet distinct from them and with a distinct etiology.

The literature of the subject which has sprung up since 1883 is voluminous, has been well reviewed from time to time and from it may be gleaned the fact that our views of the cause and course of the group of splenomegalies are not at all clear and must be subject to frequent revision as the problems of normal and pathologic physiology are solved. The tendency at present is to divide this group into three divisions, viz.: splenic anæmia as distinguished by Osler,² Banti's disease and splenomegaly of the Gaucher type, regarding which latter disease a most excellent discussion by Brill and Mandlebaum appeared as below noted.¹⁴ Many authors consider, however, that splenic anæmia and Banti's disease are different phases

of the same condition and that such a case originates with enlarged spleen and anæmia as the early symptoms and terminates with cirrhosis and ascites or some 'secondary hepatic condition. The so-called Gaucher type, of French origin, comprises a small number of cases with hereditary tendency in which primary endotheliomatous growths occur in the spleen and metastasize to the splenic and portal veins and the liver.

As Klemperer³ suggests, the name splenic anæmia seems preferable to that of Banti's disease and less liable to confusion. Such a name has a definite significance, being a necessary step toward a clear understanding of the subject.

For clinical study and especially diagnosis, three stages must be kept in mind; first, characterized by malaise, weakness, possibly repeated nausea, indefinite soreness in the splenic region, slight anæmia, lasting periodically from ten to fifteen years, occurring in young adults; the second stage that of splenic enlargement with urine scanty and dark colored, pigmented skin, diarrhœa, hemorrhages, lasting a few months to two years; the third stage that of hepatic enlargement, ascites with the other signs accentuated and terminating by cachexia, intercurrent diseases or exhaustion.

Death in one of the writer's cases of splenic enlargement was due to uræmic coma, with scanty urine, developing after eighteen months of repeated, rapid reaccumulation of ascites. The urine was progressively scanty, high colored, with but a faint trace of albumin and no casts. Post mortem, the kidneys were in excellent condition and certainly not a primary cause of the uræmia. It seems probable, therefore, that some factor other than renal disease was the cause of the fatal coma.

The ascites recurred in from seven to twenty-eight days for thirteen months, requiring twenty-nine tappings of from ten to twelve litres each. Such a condition must result in a disturbance of the normal circulatory balance in which an increased volume of blood goes to the peritoneal surface and by a progressive reduction of the fluid contents of the body insufficient water is present to carry on the normal body metabolism and excretion. This is evidenced by the progressively scanty urine which in other respects may be normal. The resulting

toxæmia may be due to unexcreted products of metabolism or to the same toxins which acted etiologically in the splenic enlargement, anæmia, etc.

Some authors, especially Kartulis,⁴ have described the occurrence of unexplained fever a few years before the onset of the condition.

As to etiology the way is divided between malaria and lues and a search for some specific infection not yet described. It is pretty generally conceded that the spleen is the primary seat of the disease, but whether such known agents as malaria, lues, kala agar, torsion of the pedicle, present all the causes, or whether a distinct etiologically unknown group exists is clearly stated but by a few authors.

As to treatment, splenectomy as early as possible, in fact, at any stage in which the patient can stand the operation, has been amply shown to be of the greatest benefit. The following case report will be of interest and is placed on record as a study of the condition.

Clinical Report.—The patient was a Polish woman, married, thirty-three years of age; father dead at forty-five years from injury; mother dead at seventy-three years of some condition producing dropsy. She has three brothers and two sisters living and well. There have been no tumors, nor recurrent diseases in the family history. She has three children living and well, the youngest one year old; has lost one of imperforate anus and one of summer diarrhœa; has had no miscarriages.

She has always lived as a working woman in this country, doing housecleaning, washing, etc. She has never used alcohol nor tobacco.

As a child she had no illnesses. Menses first occurred at 18 years, skipped two months, regular and without pain since. She has not menstruated for the past year since the birth of her last child, which was normal. She has never had malaria, typhoid nor any other acute infection. At 15 years of age she had some acute fever in which she was delirious, lasting two weeks.

Present Illness.—Five years ago she first noticed enlargement of the abdomen and felt a tumor of the left side between the ribs and the ileum, which has gradually increased and on account of which she comes. There has been some shortness of breath, grad-

ual increase of weakness, very slight pain over the tumor, but has continued at her work daily. There have been no stomach signs, no vomiting, no distress, no loss of appetite and no eructations. She has had no signs referable to the urinary organs, no pain, no colic and no increased frequency, no hæmaturia, urine free. She has had no cough, no fainting, no dizziness, no pain in chest, no signs referable to the cardiovascular system. She has had no œdema, no eruption, no skin lesions of any kind except pigmentation as stated below.

Examination showed a fairly well nourished, slightly jaundiced woman of medium build, weight 138 pounds. The jaundice is apparent in the sclera only. Her skin presented a peculiar swarthy or brownish tinge equally distributed over the body. Mucous membranes and cheeks good color. The chest was negative to examination, except the heart, which showed some left hypertrophy. Temperature 98°, pulse 74, respiration 18. Abdomen rounded, full, largest circumference below the navel, muscles greatly atrophied and relaxed, recti diastased. Skin much wrinkled, peculiarly dry, harsh and pigmented brown. Liver: upper border 6-7-10th spaces, lower border palpable, sharp, firm, slightly tender, two fingers below the ribs and across the epigastrium. In the gall-bladder region could be felt two or three firm nodules the size of a hickory nut on its edge. The surface of the liver was felt to be rough. The spleen extended from the eighth space to the crest of the ileum and to within two inches of the median line. It was firm, smooth, and not tender. On its anterior edge could be felt two notches, the lower deeper than the upper. The whole spleen was very mobile and could be pushed about on the left side of the abdomen. No bruit could be heard over it. Kidneys: neither palpable nor tender.

Blood count before operation, June 24, 1913, red blood cells 4,900,000, white blood cells 4000, hæmoglobin 80 per cent.

July 18, 1913, red blood cells 4,500,000, white blood cells 3500, hæmoglobin 80 per cent., percentage of red blood cells 90, color index .9.

Differential count, large mononuclears 16.3 per cent., small mononuclears 15.1 per cent., polymorphonuclears 63.5 per cent., transitionals 4.2 per cent., eosinophiles .4 per cent., mast .5 per cent.

The red cells showed no marked variations in size. There were no nucleated reds. Poikilocytosis moderate. Central pale

area was slightly increased. A moderate anæmia of the chlorotic type, with a marked leucopænia. Wassermann reaction was negative, one test.

Diagnosis.—Primary splenic anæmia. July 22, 1913. Splenectomy.

On the 23rd the blood count showed red blood cells 4,000,000, white blood cells 7200, hæmoglobin 80 per cent., percentage of red blood cells 80, color index 1. The differential count showed large mononuclears 5 per cent., small mononuclears 33.3 per cent., polymorphonuclears 56.6 per cent., transitionals 1.6 per cent., eosinophiles 2.5 per cent., mast .9 per cent.

The blood picture varies from that before operation in there being after operation a larger number of white cells present and an increase of small mononuclear lymphocytes at the expense of the polymorphonuclear cells, a relative lymphocytosis. The red cells show some slight variation in size as before, but the central pale area is a little more marked, poikilocytosis is the same as before operation. There is an occasional nucleated red cell of the normoblastic type.

July 27, 1913, red blood cells 4,800,000, white blood cells 13,300, hæmoglobin 90 per cent.

Urine: The urine was persistently scanty both before and after operation. For the twenty-four hours preceding operation (the patient had had a cathartic two days before) it was 1000 c.c., dark amber, clear, specific gravity 1013, acid, albumin a trace, sugar none present, contained a few leucocytes, bladder epithelia, no casts, many oxalate crystals and amorphous urates. Total nitrogen 5.96 grammes, ammonia nitrogen 6.5 per cent. of the total nitrogen.

The twenty-four hours following operation 870 c.c. Specific gravity 1032, strongly acid, dark amber color, heavy precipitate of urates, albumin a trace—less than before operation, sugar none. Total nitrogen was 12.3 grammes, ammonia nitrogen 5 per cent. of the total nitrogen.

Sixth day after operation 1140 c.c. Total nitrogen 13.9 grammes; ammonia nitrogen 4.5 per cent.

Seventh day 2050 c.c. Patient has drunk very heavily of water and this is the only time either before or after operation that the urine was above the average in quantity and contained 14.87 grammes total nitrogen, 6.3 per cent. ammonia nitrogen. Following this the urine persistently stayed at less than 1000 c.c.

Ninth day 960 c.c., 10 grammes total nitrogen, 7.2 per cent. ammonia nitrogen.

Seventeenth day 930 c.c., 4.3 grammes nitrogen; ammonia nitrogen 7.8 per cent. total nitrogen.

Six weeks after operation urine was normal in every way; specific gravity 1010, acid, albumin and sugar negative and pale amber in color.

Umber⁵ has reported a study of the nitrogen excretion in two cases of Banti's disease with splenectomy. In both cases he reports an increased nitrogen loss with a constant intake, body weight stationary. After splenectomy the nitrogen exchange became normal and there was a slight gain in weight. He believes the toxic factor is removed with the spleen.

In neither of Umber's cases was the characteristic blood picture of Banti's disease present, there being a slight leucocytosis instead of a leucopænia and the marked post-operative leucocytosis almost universally reported did not occur. The nitrogen output of the above case was normal, as well as the proportion of ammonia nitrogen, both before and after operation. This coincides with Stengel's opinion,⁶ i.e., "Disturbed metabolism is a feature common to other conditions allied to Banti's disease and probably in Banti's disease it is merely a phase in its course."

Surgical Report.—Patient operated on July 22, ether anæsthesia, iodine preparation. Vertical incision through the left semilunaris four inches long. There was a slight amount of fluid in the abdomen, peritoneum was markedly thickened, the pelvic organs were negative, both kidneys were palpable and of normal size. Stomach normal. The liver—left lobe showed a very marked, finely granular cirrhosis. The same condition was felt in the right lobe, and the nodules which had been palpated on the edge of the liver were found to be due to contracted bands of fibrous tissue. The gall-bladder empties on pressure.

The lower end of the spleen was first delivered and rolled out away from the operator, the vessels being caught as they came into view. The spleen was exceptionally long, tongue-like in shape and showed four points at which large vessels entered. The vessels were caught with rubber-guarded clamps to prevent tearing of the very delicate veins. Some difficulty was experienced in separating the spleen from the diaphragm to which it was adherent. Ligation with silk. Closure with plain gut, chromic gut on the aponeurosis and silkworm. Duration of operation forty minutes.

Pulse 94, respiration 16. The pulse promptly dropped to 76 after operation. On the following day the patient showed a rise in temperature to $101\frac{3}{5}^{\circ}$, pulse 72. This, however, subsided on the same night, and from thence on the temperature continued between 99° and 100° , finally remaining at 98 and a fraction after the ninth day.

Pathological Report.—A spleen, weight three pounds, $10\frac{3}{4} \times 4\frac{3}{4} \times 1\frac{3}{4}$ inches. The capsule is thickened, surface slightly roughened, of a bluish-gray color. On the concave surface are four points of entrance of large vessels two inches apart. Consistency unusually firm both to pressure and to the knife, cut surface beef-like in color, abnormally dry. Very little pulp can be scraped off with a knife. No malpighian bodies are visible. The veins are somewhat thickened.

Microscopically the characteristic feature of the spleen is the very marked endothelial proliferation. This has progressed to such an extent that there is very little pulp left. The endothelial cells of all the lymph sinuses, the capillaries and the blood-vessels are greatly swollen. The sinuses in places are apparently obliterated, and in such areas there is almost complete absence of the pulp cells; an occasional lymphocyte is found in the capillaries. In other areas the process is less marked and the lymphocytes are more numerous. There are occasional polymorphonuclear cells and eosinophilic cells present.

The endothelial cells of the capillaries and smaller vessels are frequently so greatly enlarged as practically to occlude the vessel lumen. The larger vessels also show this change together with thickening of the vessel wall.

The malpighian corpuscles are diminished very considerably in size, probably to one-half or one-third the normal. The central part of the corpuscle has not the usual looseness of structure but seems to be more compact, the lymphocytes lying more closely together and the supporting cells are unusually visible. The periphery of the corpuscle has the characteristic endothelial proliferation. The artery of the corpuscle also shows the thickened endothelium and wall.

As would be expected from the unusually firm consistency of the gross specimen, there is increase in the connective tissue of the organ. The capsule is roughly three times the normal thickness; the trabeculae are increased in size; the interstitial tissue in the pulp has also proliferated considerably. Throughout the organ are small granules of brownish pigment. The capillaries and connective tissue in the trabeculae contain considerable of this pigment.

In conclusion the characteristic feature of the spleen is the marked hypertrophy and hyperplasia of the endothelial structures, with very great diminution in the pulp substance and decrease in size of the malpighian corpuscles.

The liver section shows marked fibrous tissue proliferation confined to the interlobular structures, forming a multilobular cirrhosis. The intra-lobular connective tissue and the liver cells present nothing abnormal.

The peritoneum is considerably thickened and exhibits hyaline degeneration.

The points to which I wish to draw attention in this case report are the unexplained fever a number of years before, the absence of malaria, lues or an alcoholic habit, the development of primary splenic enlargement, the leucopænia before operation, the leucocytosis after operation of a lymphocytic type (*cf.* 1, 7, 8), and the marked improvement of the patient after splenectomy, the endothelial proliferation approaching that seen in the Gaucher type of splenomegaly.

Later observations, August 30, red blood cells, 5,200,000, white blood cells, 12,000, hæmoglobin, 95 per cent.

The anæmia has rapidly been corrected. The leucocytosis was due to the relative lymphocytosis as in the other counts after operation. It has required as long as five years for the re-establishment of the normal differential leucocyte count in cases reported by Banti, Senator, Wolff.

I am greatly indebted to Dr. E. P. Neary of Charity Hospital resident staff for most careful blood counts, to Dr. H. H. Haskins, Associate Professor of Organic Chemistry, W. R. U., for urine analyses, and to Dr. J. D. Pilcher of W. R. U. for his report on the pathology of the specimens. I shall be pleased to furnish a rather extensive bibliography to anyone desiring it.

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ILEOCÆCAL TUBERCULOSIS.*

BY JOSEPH WIENER, M.D.,

OF NEW YORK CITY,

Associate Surgeon, Mt. Sinai Hospital.

OUR knowledge of this subject really dates from 1891, in which year Billroth in Vienna, and Hartmann and Pilliet in Paris, simultaneously insisted on the fact that tubercular lesions existed in the cæcum, lesions which had before then been taken for carcinoma. Since then we have found out that the cæcum is more frequently the seat of tuberculosis than any other part of the alimentary tract. Both sexes are equally affected; one observer reported 36 males and 42 females, and another 48 males and 35 females. It is found oftenest between the ages of twenty and forty years. Clinically there are two sets of symptoms, first, those of peritoneal reaction, and second, those of intestinal stricture. As the disease, when left to itself, is always fatal, operation is indicated in all cases.

Thirteen years ago the writer was fortunate enough to operate on a very complicated case, which finally turned out to be an ileocæcal tuberculosis. Ever since then he has been on the lookout for these cases, and has succeeded in recognizing about ten others at operation. No doubt some others were overlooked or were operated on as cases of appendicitis. Cases of simple tubercular ulcers in the appendix are not included in this paper. We believe that these cases of ileocæcal tuberculosis are not so rare as the scarcity of the literature would make us believe. They are often mistaken for cases of appendicitis with inflammatory exudates. We have several times operated on such cases but were unable to get a positive diagnosis of tuberculosis from the material removed, although we felt quite sure that we had to deal clinically with tuberculosis.

It was in the hope of throwing some light on this rather

* Read before the Surgical Section of the New York Academy of Medicine.

neglected field of abdominal surgery that we decided to report our cases. And we were the more prompted to do so by the fact that we were unable to find a single monograph by either an English or American surgeon on this topic. Most of our cases were operated upon in Dr. Lilienthal's service at Mt. Sinai Hospital since 1906. Before 1906 the cases were rarely recognized, and our records are not as accessible or as complete before that date.

In spite of the fact that the ileocæcal region is one of the sites of election for intestinal tuberculosis, but little has been written on the subject, and our text-books almost ignore it. This we believe is at least in part due to the difficulty in making the diagnosis at operation, or even by the pathologist. Many of these cases, perhaps most of them, come to operation with the diagnosis of appendicitis. We find an inflammatory tumor which the pathologist usually reports as "chronic inflammation." We remove the appendix, sometimes a fecal fistula develops, which we close at a subsequent operation. Every surgeon sees such cases and puts them down as cases of appendicitis. In some of them there is a tubercular ulcer inside of the appendix or cæcum, with an inflammatory exudate around the intestine. If we remove some or all of this exudate, the pathologist is quite right in calling it inflammatory. If we ask for serial sections through the appendix or cæcum (if it was removed) then often a small tubercular ulcer will be found, and the diagnosis cleared up. The first case that the writer encountered was a case of this kind. At the first operation the greater part of a large inflammatory tumor around the cæcum was removed, and on section was pronounced chronic inflammation. At a subsequent operation, more of the tumor and the greater part of the appendix were removed, and again pronounced chronic inflammation. At a third operation for the closure of a fecal fistula, the stump of the appendix was removed and again the report came back chronic inflammation. We requested that more sections be made and finally a typical tubercular ulcer was found in the appendix and the diagnosis was established. Since then the writer has frequently seen similar cases, but in

very few could the diagnosis of tuberculosis be substantiated by the microscope. We must not forget that in most of these cases the cæcum is not removed and the tubercular focus is often inside of the cæcum.

The most practical classification of these cases was made by Hartmann. He distinguishes two classes of cases: First, ulcerative enteroperitoneal tuberculosis of the cæcum; second, hypertrophic cæcal tuberculosis, the so-called ileocæcal tubercular tumor.

In class one we find either ulceration with perforation and abscess formation, in which case the disease is serious and hard to cure, especially as fecal fistula often develops; or, we find ulceration with stenosis, and frequently adhesions to the adjoining viscera or to the parietal peritoneum.

Class two is the chronic form to which attention was drawn by Billroth, Czerny, Terrier, and Hartmann. These cases usually present a palpable tumor, often of considerable size. The neighboring lymph-glands are usually enlarged.

Etiology.—Is the disease primary or secondary? Conrath believes that in children we do find it as a primary lesion, but that in adults it very rarely is. Hartmann, Baum and others, on the contrary, believe that it often is a primary disease. Tomita, likewise, reports four cases in which the lungs and other organs were sound. This was true in at least three of our cases. In seven cases, Baum twice found a slight pulmonary tuberculosis, and in one case a tubercular peritonitis and an advanced pulmonary process. Campiche collected 279 cases and in less than one-third was there a pulmonary lesion; and ten per cent. had extensive intestinal and peritoneal tuberculosis. Now is it fair to assume that the ileocæcal lesion is secondary because there is a slight pulmonary tuberculosis? It is even possible, in some cases, that the pulmonary lesion may be secondary to the ileocæcal lesion. I myself saw such a case at the very beginning of my medical career. The patient, a lady of about forty years, had always been well until she developed an ileocæcal tuberculosis. The appendix was removed and the abscess drained, but the wound did not heal, and six months

later she developed an acute pulmonary tuberculosis, from which she died. The tubercle bacilli get into the intestine either with food or drink, or are swallowed with the sputum.

A tubercular ulcer in the appendix will not always give symptoms. In one hundred consecutive autopsies of cases that died of tuberculosis, Sonnenburg found two cases of tuberculosis of the appendix which had given no symptoms.

Preëxisting ileocæcal disease is a predisposing factor to the development of ileocæcal tuberculosis, *e.g.*, the swallowing of tubercular sputum infecting a preëxisting ulcer of appendix or cæcum. But even in cases without pulmonary tuberculosis repeated inflammation of the appendix will leave damaged tissues which are prone to tubercular infection. That these preëxisting inflammations in the appendix and cæcum play a rôle is proven by Hartmann, who found that in eighty-five per cent. of all intestinal tuberculosis the ileocæcal region was affected. In nine per cent. of the cases only the ileocæcum was affected. Anatomic relations no doubt also play a rôle. In the small intestine the fecal current is pretty active and the bacilli are carried along rapidly by the stream. But when they enter the cæcum there is a marked slowing of the current, which suddenly is deflected to a right angle, and then travels uphill. This gives the bacilli an opportunity to become lodged, either on a preëxisting ulcer, or in one or other of the lymph follicles, which, especially in children, are very abundant in this region. Another source of infection is the mesenteric glands in the vicinity of the ileocæcum. From them a retrograde infection of a preëxisting cæcal ulcer can take place.

Pathology.—In the enteroperitoneal tuberculosis of the cæcum we first find tubercles in the mucous membrane surrounded by an inflammatory zone. These tubercles coalesce and form a flat ulcer with undermined edges. If such ulcers heal they produce more or less stenosis. As the process progresses tubercles develop on the serosa, and through these lymphatics become infected. As a result of the inflammation there is an adhesive peritonitis and the neighboring loops of small and large intestine become adherent to one another and to the

parietal peritoneum, and thus a palpable tumor may result. In this way the disease may be limited to the affected area. In other cases there is a cheesy degeneration of the tubercles and an abscess develops. In some cases the ulcer of the mucous membrane spreads through the muscular and serous coats, causing a perforation of the intestine, and a resulting abscess. This is the pathological picture in the enteroperitoneal or ulcerative cases.

In the cases of tubercular ileocæcal tumor, the process is more localized and spreads upward along the cæcum, whereas in the ulcerative cases the ileum is more affected. There is no cheesy degeneration, not much ulceration, but an enormous production of connective tissue. The cæcum is the seat of a firm fibrous tumor, with which the appendix is usually intimately connected. The hypertrophy involves all three coats of the intestine. The serosa often shows no signs of tuberculosis, the mucous membrane is the seat of ulceration, although the tumor can develop without ulceration of the mucous membrane. There is regularly stenosis of the lumen. Adhesions to the parietal peritoneum come only late in the disease. This free mobility is an important sign in the differential diagnosis. The slight or absent cheesy degeneration, the difficulty in finding tubercle bacilli in the microscopic sections, would lead us to believe that few and not very virulent bacilli cause the disease. The chronicity of the disease, likewise, speaks for this. The enormous connective tissue formation is so uncharacteristic of tuberculosis that some authors have doubted it. But there are other tubercular lesions which resemble it. Langhans was the first to point out the similarity to hypertrophic forms of lupus. Here also we have a slowly progressing disease, with extensive cellular exudate, replaced in time by scar tissue; and in lupus also we find few tubercle bacilli.

Symptoms.—I. Enteroperitoneal form. The symptoms are not characteristic. There is gradual increasing pain in the right iliac fossa lasting several months; later, nausea, vomiting, and belching. At times we find a slight evening temperature, loss of weight, and sometimes diarrhœa with blood and mucus.

After a certain time a mass is felt; it is usually hard and not sharply defined.

2. Ileocæcal tubercular tumor. At first the symptoms are similar to those found in the enteroperitoneal form. The patient sometimes dates the onset of the disease to a trauma; there is either diarrhœa, or alternating obstipation and diarrhœa. This by some authors is considered a characteristic symptom. Later there is a stricture of the gut, and then we find severe colic. The writer recently operated on a case of this kind, in which the first symptoms were those of intestinal obstruction. There had been no preëxisting symptoms referable to the intestine. Usually the colic at first is mild and then gradually increases in severity. As many as ten attacks have been noted in one day. Later we find vomiting, chills, fever, meteorism, and intestinal peristalsis becomes visible; in other words the picture of intestinal obstruction. In the right iliac fossa a tumor of considerable size can be felt, it is not very tender to the touch and is regularly freely movable. By distending the colon through the introduction of air into the rectum, the tumor can be made to approach closer to the abdominal wall, and can then be more easily palpated. According to Conrath the average duration of the hypertrophic cases is two and a half to three years, although it is hard to state exactly when the disease started. But we do know that it is a chronic disease, in the absence of complications, and that the patients, if not operated upon, die after a long time, either of cachexia, pulmonary or intestinal and peritoneal tuberculosis.

Diagnosis.—1. Enteroperitoneal form. It is very difficult, if not impossible, in many cases to differentiate it from appendicitis. If the general condition is very poor, or if there are sweats or persistent diarrhœa, the diagnosis is easier.

2. The hypertrophic form. In the early stages it resembles very much the ulcerative form and the diagnosis is very difficult, not to mention again the similarity to appendicitis. But we must also differentiate it from malignant neoplasms. In carcinoma we do not find the symptoms of intestinal obstruc-

tion, certainly not so early in the disease. The pain is not so severe, and the tumor is more apt to be fixed. Salzer states that if in a given case we find a long-standing stenosis of the gut with a freely movable tumor, the diagnosis is tuberculosis and not carcinoma. In tuberculosis the tumor is more apt to be smooth, in carcinoma nodular. In children we must also differentiate from ileocæcal intussusception, especially the chronic form.

Treatment.—1. Artificial anus formation. 2. Complete intestinal exclusion. 3. Ileocolostomy, with or without intestinal exclusion. 4. Partial or complete excision of cæcum and ileum.

The removal of the appendix is indicated in practically every case

1. *Artificial Anus Formation.*—This is rarely indicated, and then only as a temporary expedient in desperate cases, to be followed later by a lateral anastomosis or an excision. Statistics show that 83 per cent. of these artificial anus cases die.

2. *Complete Intestinal Exclusion.*—This operation was performed in a few of these cases, but it would very rarely be indicated to-day.

3. *Ileocolostomy, with or without Intestinal Exclusion.*—This simple operation, with a low mortality rate, will cure a large number of our cases. We have been accustomed to do it by the same technic that we employ in doing a Moynihan gastro-enterostomy, using clamps and linen sutures. The ileum and cæcum, at least three inches away from the diseased area, are approximated without tension. Clamps are applied as in doing a gastro-enterostomy, and a posterior continuous serous suture is applied. The intestine is then opened, the redundant mucous membrane excised, and the interior of the gut is carefully swabbed out with alcohol. A running continuous suture (Connell) quickly closes the intestinal canal. This suture passes through all the coats of the gut and the knot is on the inside. The clamps are now removed and if there is any leakage (which there should not be) one or two reinforcing sutures of linen are applied. The posterior continuous serous suture, which had been left long, is now continued anteriorly as a serous suture,

covering the through and through suture completely. If there was no abscess, after removing the appendix, the abdomen is closed without drainage. The anastomosis should be made far enough away from the diseased area to allow, if necessary, of a subsequent resection of gut. If desired, this lateral anastomosis can be combined with an intestinal exclusion. This would be indicated in cases involving a large part of the ileum and ascending colon. But in many of the cases the anastomosis alone will bring about a cure. Alglave collected 29 cases of lateral anastomosis (in some cases with intentional formation of a temporary fecal fistula) with 27 recoveries, a mortality of less than 7 per cent. The mortality after intestinal resection is more than twice as high. In desperate cases a simple incision and drainage, perhaps with the removal of the appendix, will be life-saving, and a lateral anastomosis can be done at a later sitting. If the disease is extensive, the operation advocated by Lane for severe cases of atony of the colon can be done. The ileum is divided, both ends closed, and a side-to-side ileocolostomy or ileosigmoidostomy done. In this way part of the ileum, the cæcum, and the colon can be excluded.

4. *Excision of Intestine.*—Extensive adhesions around the diseased area form a contra-indication, on account of the great risk involved, to an immediate excision. If the tumor cannot be lifted out of the abdomen, the dangers of an excision are too great. If the tumor is freely movable and an excision is to be done, after lifting the tumor out of the abdomen, the mesentery of the ileum and the mesocolon are ligated close to their intestinal attachments and divided. The ileum and cæcum are clamped and the diseased intestine is then cut away. The ends of the intestine can be united in various ways, but the best results have been obtained with side-to-side anastomosis with sutures, after first closing both open ends with several layers of sutures. Mikulicz did the resection in two stages. At the first operation the tumor was brought out of the abdomen and the abdominal wound was carefully sutured. At the second operation the intestine was resected. Far better it seems to us to do a lateral anastomosis at the first operation; and then, if necessary, at a second sitting to do the resection. If we proceed

along these lines we will cure many of these cases by the first operation, and with a very low mortality rate. Whereas the intestinal resection, whether done at one or two sittings, will always give a high mortality. If the resection is done at the first operation, not only will the mortality be very high but we will sometimes be doing a resection where a lateral anastomosis alone might bring about a cure. Hartmann, in 1907, advised intestinal resection in the hypertrophic form, together with the removal of the glands in the ileocæcal angle. Where there is an extensive mass of adhesions and the resection in consequence is too dangerous, he advises intestinal exclusion. Alglave collected 50 cases of resection of ileum and cæcum with 7 deaths, a mortality of about 14 per cent. We believe that if all cases were reported, the mortality from primary resections would be considerably higher.

Breiger, in his excellent Inaugural Dissertation, collected 27 cases operated by resection, from 1905 to 1909. The operation showed a mortality of 15 per cent. Campiche, who collected the cases prior to 1905, found an operative mortality following resection of over 20 per cent., *i.e.*, of 154 cases of resection 34.41 per cent. were cured permanently, 20.12 per cent. died shortly after the operation, and 13.63 per cent. died of the disease at a later period. In this same list of Campiche we find 35 cases of lateral anastomosis with partial intestinal exclusion, with an operative mortality of 11.43 per cent., a later mortality of 25.7 per cent. and 45.7 per cent. permanently cured. In other words, not only does the lateral anastomosis give a very much lower mortality than resection (about half) but the percentage of permanent cures after the lateral anastomosis is also greater. Of course we must not lose sight of the fact that the lateral anastomosis was probably done oftener in the earlier cases, and the resections in the more extensive cases. But even taking this into account, for the reasons given above, we firmly believe that the lateral anastomosis, with or without intestinal exclusion, should be our operation of choice in the large majority of our cases. And we must not forget that these patients come to us in none too good condition. We usually find marked anæmia, loss of weight, often subacute intestinal

obstruction, and at times peritonitis and abscess formation. Such patients do not stand primary intestinal resection well. But even in desperate cases a lateral anastomosis will overcome intestinal obstruction, thereby tiding over a critical period. And even desperate cases will often improve so much that no further operation will be necessary. In some cases the intestinal obstruction *per se* is the cause of the patient's poor general condition. The tubercular ulcer may even be healed, leaving a stricture with a large inflammatory exudate around it. These are ideal cases for lateral anastomosis.

Conclusions.—Ileocaecal tuberculosis is usually a primary lesion. The infection takes place either from tubercle bacilli that have been swallowed (milk or sputum) or through the mesenteric glands. Pathologically we distinguish two forms, the ulcerative or enteroperitoneal and the hypertrophic ileocaecal tumor. The diagnosis is very difficult owing to the similarity to appendicitis, with which diagnosis most cases come to operation. The two operations to be considered are lateral anastomosis with or without exclusion, and resection. In the majority of cases we suggest the lateral anastomosis first, and there will then often be no secondary operation required; or, if required, it will be done under much more favorable conditions.

CASE I.—Barnett S., twenty-five years, cap maker, admitted February 25, 1906. Family history negative. Previous history, four months ago attack of right iliac colic with vomiting, lasting three days. Right lower abdomen tender for following five weeks. Present trouble began eight days ago with right iliac colic; vomited twice. Colic lasted two days. Bowels constipated. At present patient has burning pain in right iliac region.

Physical examination, G. C. good, well nourished. Abdomen flat, symmetrical, no rigidity. In right iliac region is felt a small nodular mass, somewhat tender.

Operation (February 28).—Dr. Wiener. Resection of ileocaecal junction, end-to-end anastomosis. Findings, moderately hard inflammatory mass involving wall of caecum and ileum at ileocaecal junction, and involving mesentery of ileum. Several enlarged soft glands in mesentery.

Patient reacted nicely, ran smooth course until ninth day, on which day he died suddenly with symptoms of cerebral embolism.

This operation was done eight years ago. To-day in a similar case I would do an ileocolostomy. The exact cause of death is unknown. But even if the patient did have a smooth convalescence for nine days and then died suddenly with symptoms of cerebral embolism, the writer believes that the patient would have recovered if no intestinal resection had been done.

CASE II.—Louis S., age forty-five, peddler, admitted May 9, 1907. Family history negative. Past history, pneumonia two months ago. Present trouble began eight days ago with sudden sharp pain in right iliac fossa. Pain was localized here for two days and then became general over entire abdomen, stabbing in character. Bowels regular, no blood in stool, no dysuria. No sweats, no chills. Appetite good. No vomiting, moderate fever. Temperature 99.6°, pulse 100, respiration 26. Tubercle bacilli found in sputum.

Physical examination, G. C. fair, some anæmia. Lungs: Signs of cavitation at right apex. Abdomen: Irregular tender mass, size of a hen's egg, in right iliac fossa.

Operation (May 9).—Dr. Wiener. Abdomen opened. Ileocaecal region thickened and imbedded in adhesions and exudate. When adhesions were separated considerable pus escaped. Specimen of inflammatory tissue excised for examination was reported as tuberculosis. B. M. drain inserted, abdomen closed.

July 1, small granulating sinus persists. G. C. improved. Patient discharged. No subjective symptoms. Weight stationary at 90 pounds.

We firmly believe that many cases of this kind are put down as cases of appendicitis. Had we not suspected tuberculosis and sent some of the inflammatory tissue to the laboratory, this case also would have been overlooked. This case should have had an ileocolostomy done.

CASE III.—Nathan Z., twenty-eight, cigar-maker. Admitted June 6, 1907. Family history, father died of diabetes. Past history, for six months cough and bloody expectoration. Present trouble, onset twelve weeks ago with diarrhoea. Six to eight movements daily, stools watery and contain mucus. Loss of

twelve pounds. Epigastric distress and abdominal cramps for past few weeks.

Physical examination, G. C. fair, emaciated. Abdomen: Retracted, scaphoid. Tender, rounded mass in right iliac fossa. Tenderness over entire colon. Lungs: Dulness and harsh breathing at right apex anteriorly and posteriorly. Glands: Moderate enlargement of cervicals, axillaries, and inguinals.

June 9, no diarrhœa since admission. Temperature 99° to 101° , pulse 92 to 108, respiration 24 to 30. Urine negative. Stool and sputum negative for tubercle bacilli.

June 21. Severe diarrhœa for several days. Operation by Dr. Wiener. Abdomen opened. Thickening and induration of ileocæcal region, with deposit of fine miliary tubercles on lower end of ileum. Appendicostomy done.

Post-operative treatment, irrigations with weak silver nitrate solution. Forced diet and tonics.

July 26. Patient's condition very slightly improved. Leaves hospital to-day at his own request.

Remarks.—Appendicostomy should no longer be considered in these cases. This case should have had an ileocolostomy done. He was told to return for further operation but did not report again.

CASE IV.—Becky T., single, seventeen years, tailoress, admitted July 31, 1908. Family history negative. Menstrual history negative. Past history, typhoid at six years. Attack of general abdominal cramps with vomiting and fever three years ago, lasting one day. Since then occasional transient attacks of epigastric pain unrelated to the taking of food and unassociated with pain or vomiting.

Present trouble, for three months patient has had more or less continuous dull pain in right lower abdomen, with occasional attacks of severe cramps in same locality. Has been unable to work for past month. Seven pounds loss of weight. No sweats, no chills, no fever, no vomiting. No dysuria. Bowels constipated. One movement every three to six days. Temperature 99° , pulse 90, respiration 24.

Physical examination, G. C. good, well nourished, some anæmia. In right iliac region is felt a hard, elongated, irregular nodular mass, size of hen's egg. Mass is firmly fixed, somewhat tender. No rigidity. No other masses, no head zone. Lungs negative.

Operation (August 1, 1908).—Dr. Wiener. Abdomen opened. Inflammatory mass found consisting of ileocaecal junction thickened, and imbedded in adherent omentum. Appendix dissected from mass and amputated. Ileocolostomy done with sutures. Numerous enlarged hard mesenteric nodes palpated. No drainage. Duration of operation 1 hour.

August 8. Primary union. Temperature, pulse and respiration normal.

August 21. Symptoms alleviated, bowels regular, G. C. good. Sent to Betty Loeb Home to convalesce.

The patient returned in January, 1914. She had been well for five years following operation. She then began to have pain in the right iliac fossa when walking fast and when turning over in bed. During the past six months she had had three attacks of general abdominal pain, worse on the right side. With two of the attacks there had been vomiting. The general condition was fair and there had been no loss of weight. The examination of the lungs was negative. The abdomen was soft and not distended. In the right iliac fossa there was a small, soft, freely movable, tender mass. On opening the abdomen adhesions were found about the ileocolostomy opening which kinked it, and no doubt caused the attacks of subacute intestinal obstruction. There was no sign of any tuberculosis, and no enlarged glands were found. We made a new side-to-side ileocolostomy between the ileum proximal to the old anastomosis and the transverse colon. Recovery was uneventful.

CASE V.—Ben. L., twenty years, butler, admitted September 20, 1908. Family history negative, previous medical history negative.

Present illness began eight days ago with sharp pains in right iliac fossa which have been persistent. Vomited once at onset. Some fever but no chills. Appetite fair, no loss of weight, bowels regular, no blood in stool, no dysuria.

Physical examination: In the right iliac fossa, rather high up and near outer border of rectus, is a mass size of an orange, slightly movable, not tender. No other masses. Examination otherwise negative. Temperature 99°, pulse 80, respiration 22. Urine negative.

Operation (September 25, 1908).—Dr. Wiener. Abdomen opened, ileocaecal region found to be very much thickened and surrounded by adherent omentum and plastic exudate. Ileocolos-

tomy made in usual style. One cigarette and one tube drain placed.

October 25. G. C. good, temperature normal, moderate faecal discharge from wound.

Operation (November 11).—Sinus excised, led to tiny leak in anastomosis. This leak was repaired with Lembert sutures, three rows. The appendix was removed and abdomen closed, small tube drain. The exudate present at time of first laparotomy was found to be entirely resolved.

December 12. G. C. excellent, wound healed. Temperature normal, patient gaining weight, no subjective symptoms. Discharged well.

This case demonstrates very well how even a large exudate will disappear after ileocolostomy is done. Seven weeks elapsed between the two operations and in that time the exudate had entirely disappeared. No microscopic examination was made in this case, but it was clinically an ileocæcal tuberculosis.

CASE VI.—Harry J., sixteen years old, office boy, admitted January 26, 1912. Past history, mastoid operation at six years of age. Best weight 96 pounds. Present trouble, three weeks ago sudden onset of abdominal cramps beginning in right iliac region. Had some fever, no chill, no vomiting. Bowels constipated, frequent and painful micturition for past few days. No blood seen in stool.

Physical examination, general physical, heart and lungs, etc., negative. Locally, abdomen: There is general rigidity of the abdomen. In the right iliac fossa may be felt a large, hard, rounded, discrete mass occupying the greater part of the lower right abdomen. Only slightly tender. Rectal: The pelvic floor is depressed by the abdominal mass which feels hard, just as by abdominal examination. Temperature 101°, pulse 104, respiration 24.

Operation (January 26).—Dr. Joseph Wiener. McBurney incision. Extraperitoneal mass encountered, on section soft yellowish-gray cellular tissue. Peritoneum opened and right pelvis found to be the seat of a large hard mass apparently connected with gut. A second mass was encountered and delivered, proving to be greatly thickened omentum. This was resected. The large mass was then bluntly opened with the finger, the appendix isolated and amputated. Abdomen closed without drainage.

January 28. Faecal fistula established through wound.

February 10. Fæcal fistula has closed spontaneously.

March 2. Wound healed, patient discharged well.

Pathological Report.—Chronic inflammatory tissue, suggestive of tuberculosis.

CASE VII.—Solomon M., baker, aged twenty-nine, admitted August 15, 1913. Family history negative. Past history negative. Present trouble, for past three weeks patient has had pains referred to right iliac fossa. No vomiting, moderate fever. Night sweats during past week. Has lost 20 pounds during past few weeks. White blood cells 10,500, polynuclears 68, lymphocytes 32. Temperature 98°, pulse 72, respiration 24. Urine negative. G. C. good. Lungs negative. Abdomen: In right iliac fossa is to be felt a hard, irregular, non-tender tumor mass size of an orange. Tumor is slightly movable upward and downward, but is apparently fixed to lateral pelvic wall.

August 18. Abdomen opened over mass. Ileocæcal region found to be thickened and surrounded by exudate, adherent to lateral pelvic peritoneum. Ileocolostomy, from ileocæcal valve to six inches from caput coli. Abdomen closed without drainage (Dr. Wiener).

August 31. Wound completely healed.

September 16. Patient on roof. G. C. much improved, no subjective symptoms, gain of ten pounds in weight since operation. One or two normal stools each day without cathartics. Temperature, pulse and respiration normal.

The night sweats and rapid emaciation led us to make a probable diagnosis of ileocæcal tuberculosis.

CASE VIII.—Mrs. J. S., thirty-five years old, was first seen by the writer in July, 1913. Her parents were alive and well. There was no family history of tuberculosis. For the past year she had complained of a feeling of weight and a dull ache in the right iliac fossa. This ache had been present only at intervals, had not been severe nor had it increased in severity. She had had four children, who were alive and well. Six weeks before the writer saw her she had had a curettage done. This had been followed by vomiting, general abdominal pain, and distention. The bowels had moved with enemata. These abdominal symptoms lasted four or five days. Following this there were repeated similar attacks, the pain being most marked in the right iliac fossa. The attacks occurred once or twice daily and increased in severity. When on fluid diet, the attacks were less marked. These attacks were undoubtedly due to subacute intestinal obstruction and were

more marked when the patient took solid food. On July 15, the abdomen was opened and an inflammatory mass found around the cæcum. The appendix and right ovary were removed. Following this operation the attacks of abdominal pain persisted. On July 29 the abdomen was again opened and a large inflammatory mass found involving two coils of ileum and the cæcum. One of the coils of ileum was distended and the other collapsed. A lateral anastomosis was made with sutures between these two coils of ileum, and the abdomen closed without drainage. Recovery was uneventful, and there was no return of the intestinal obstruction. When seen recently the patient had gained fifteen pounds, and the only thing that could be felt was a small indefinite mass in the right iliac fossa. When last seen in January, 1914, the patient had gained still more in weight and nothing abnormal was felt in the abdomen.

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THE EXPERIMENTAL STUDY OF INTESTINAL OBSTRUCTION.

BY HARVEY B. STONE, M.D., B. M. BERNHEIM, M.D.,

AND

G. H. WHIPPLE, M.D.,

OF BALTIMORE, MD.

(From the Hunterian Laboratory of Experimental Pathology of the Johns Hopkins University.)

THE purpose of this paper is to correlate and summarize the work done in the Hunterian Laboratory of the Johns Hopkins University on certain aspects of the problem of intestinal obstruction, and to place the data thus obtained before a clinical audience. Frequent reference will be made to papers appearing in other publications of a somewhat different character from this, in which papers there are full reports of experiments performed and references to the literature of the subject. For this reason the present article will be devoted to a consideration of the general facts discovered and the inferences deduced therefrom, with but an outline presentation of the detailed evidence upon which these facts and inferences are based. Those desiring a closer study of the minutiae will experience no difficulty in obtaining the articles referred to.

In the *Johns Hopkins Hospital Bulletin* for June, 1912, the authors of this paper published an article entitled "Intestinal Obstructions; A Study of the Toxic Factors." This paper dealt with a series of experiments conducted upon closed loops high in the intestinal tracts of dogs. It was discovered that when one ligates the duodenum just aboral to the pancreatic duct and again at about the point of mergence of the duodenum into the jejunum, death rapidly ensues, usually in 24 to 60 hours, although the continuity of the alimentary canal be restored by gastrojejunostomy or other operations for short-circuiting the occluded loop. Based on this funda-

mental finding a series of experiments was conducted to ascertain, if possible, why dogs with these high closed loops died. Thus the loops were washed before closing them and left empty. The ligatures were so placed that the secretions from the stomach, liver and pancreas could not gain access to the closed loop. In this manner it was believed that substances arising from food products, bile, gastric or pancreatic juice could be excluded as probable sources of the fatal results. The entire removal of the loop in question did not in any way interfere with the health of the animals. The ligations of the loop were executed in such a manner as to avoid any considerable disturbance of the circulation. From these experiments it was concluded that death was not due to the impairment of a part of the bowel necessary (*per se*) to life, nor was it due to any factor dependent upon the circulation of the bowel.

The symptoms of the dogs in the post-operative period were quite characteristic. The dogs soon showed that they were sick. They refused food, often vomited, and had every appearance of being intoxicated. A noticeable dulness and apathy began to develop. Slight muscular tremors commenced. The gait, especially of the hind legs, became staggering and ataxic. Weakness and muscular tremors rapidly increased and the pulse became very weak and thready. Near the end there was a marked fall in blood-pressure, a subnormal temperature, and great prostration. There seemed to be no pain.

The autopsy findings present a very uniform picture. Thorax, heart, and lungs are negative. Spleen, pancreas, kidneys, adrenals and blood-vessels are normal except for congestion. There may be a slight amount of dry plastic peritonitis over the closed loop and its adjacent loops. The liver may show some congestion and in some cases a little fatty degeneration. The closed loop is practically the only structure that deviates from the normal. It contains a greater or less amount of fluid, its walls are often mottled with purple areas of hemorrhage, and stippled with grains of fibrin. There may be areas of necrosis in the wall and in some cases these have

led to perforation. The fluid in the loop is very characteristic, of a dirty slate or dull red color, about the consistency of thick soup, and often containing considerable mucus, blood, and desquamated epithelium. The material may be dry, pasty and like butter, but of slaty color. The mucosa of the loop may be normal or show a little diffuse reddening, or may be specked with ecchymoses and show shallow ulcers with red swollen margins. Microscopic examination of the organs shows only occasionally fatty degeneration of the liver. The duodenal loop may show acute inflammatory reaction, especially about the ulcers when these are present. In many cases, however, the mucosa is quite normal.

From a consideration of the manner of death just described, we assumed that the dogs were the victims of an intoxication, and that the toxic material originated within the loop. To test this assumption the fluid accumulated within the loops was carefully studied. The detailed experiments may be found in two papers published by the present writers in the *Journal of Experimental Medicine*, vol. xvii, No. 3, 1913. The fluid was usually digested for days at 38 degrees C, heated for one-half to one hour at 60 to 70 degrees, centrifugalized, and filtered through a Gooch crucible or porcelain perforated funnel. It was then administered to normal animals usually intravenously, and the effect observed with kymographic readings. There is usually a rapid profound fall in blood-pressure, followed by a rise to normal, and then a prolonged secondary fall to one-half or one-third of normal, if a lethal dose of poison has been given. The temperature falls, the pulse is scarcely palpable and there are conspicuous muscular tremors. Vomiting and profuse diarrhoea occur in cases where fatal doses have been given and the watery stools are blood streaked. Respiration becomes very slow and deep some time before death. Small amounts of the concentrated duodenal fluid may be sufficient to cause death within three to five hours, but the fluid varies in toxicity. At autopsy dogs killed within three to ten hours by injection of the fluid present characteristic findings. The blood remains fluid much longer than normal and clotting is

slow. The liver, spleen, and mesenteric vessels show great engorgement. The gastro-intestinal tract shows the most striking changes. There is a moderate congestion of the mucosa of the cardiac portion of the stomach, but that of the pyloric end remains pale. About one centimetre below the pylorus there is a sharp line of demarcation separating the pale mucosa from the deep purple velvety mucosa of the duodenum. The duodenum is relaxed, usually contains fluid and its engorged mucosa is coated with thick mucus. The jejunum presents a similar picture, but the intensity of the color usually fades to pink in the lower ileum. The large intestine shows some congestion of its mucosa and ecchymoses are not infrequent. On microscopic examination, there is found great engorgement of the capillaries in the villi and no other change except occasionally some escape of red cells into the tissues. These findings are also encountered when the duodenal fluid is introduced into the peritoneal space of normal dogs, or subcutaneously instead of intravenously, except that death ensues some hours later, due no doubt to slower absorption.

It is quite evident from the facts just presented that the supposition of a poisonous substance or substances existing within these closed loops is correct. There are but two readily conceivable sources from which such a toxin might arise, the secretion of the mucosa of the duodenal loop or the activities of the bacteria present. It is of course possible that these two factors are both necessary and that their mutual interaction is the essential thing. In order to determine if possible which of these factors, if either, could be eliminated, repeated attempts were made to render the loops sterile without injury to the mucosa. All of these experiments failed to produce the condition desired. The other side of the problem was then attacked, and successfully. That is to say, by washing the loops with a four per cent. solution of sodium fluoride the mucosa was practically entirely destroyed, whereas bacterial growth continued unchecked. The fluid collected in such a loop did not possess the toxic properties on injection into normal dogs that were detailed above. In short the removal of

the mucosa renders the formation of the toxin impossible and shows conclusively that it is essential to the development of the phenomena characteristic of these closed loop experiments. Further evidence will be adduced below to show that the intoxication following such closed loop experiments is due to changes in the mucosa itself and while not clearly understood as yet, are perhaps best described as due to a perverted physiological activity of the mucous membrane. That bacteria may play a rôle in instituting this perversion cannot at present be denied.

We have shown that when closed loops of the type under consideration are made, death results, and that in the loops there accumulates a toxin. Further, the source of this toxin is the mucous membrane of the loop. Does the toxin cause the death of the animal, or is it simply a collateral and not a causal phenomenon in the chain of development leading to the fatal termination of these experiments? At once the suggestion presents itself that an enterostomy into the closed loop, affording external drainage for its contents, might throw light on this point. Numerous experiments of this type were made, the loop being closed as usual, but then pulled up into the wound and opened so as to drain freely. Very interesting results were obtained. It is quite possible by such means to keep the animal alive for weeks or months—indeed, so far as we know, indefinitely—in favorable cases. And in all cases life is somewhat prolonged beyond the maximum period attained with the undrained loops. This would seem to show the intimate relation between the absorption of the loop poison and the death of the animal. The same relation is indicated by the similarity of symptoms in dogs dying from closed loops and those dying from the injection of loop toxin. We feel that it is safe to assume that the toxin described is really the active factor causing the death of animals with the duodenal loop. Parenthetically, it may be said here that other parts of the intestine have been studied to some extent by ourselves and in more detail by others, notably Bunting and Jones, *Journal of Experimental Medicine*, July, 1913. It is the

general finding that the disturbances are most pronounced following the formation of loops in the duodenum and high jejunum and become markedly less as one approaches the colon.

Having concluded that the mucosa is primarily the source of the substance responsible for the intoxication, attention was directed toward a study of the mucosa itself. Repeated experiments showed that if the mucosa of a closed loop be carefully washed, then scraped off, and allowed to autolyze in normal salt solution in a thermostat for twenty-four hours, then treated as the loop contents were treated (described above) and injected intravenously into healthy dogs, it gave evidence of the loop toxin. In other words the toxin is not only in the lumen of the bowel in these cases, but in the cells of the mucous membrane itself. Furthermore, in the majority of dogs in which loops were drained, death occurred within five to eleven days, and the mucosa from these loops treated as just described also showed the presence of the toxin. (Why some dogs with drained loops die and why others survive will be considered later.) On the other hand ample experimental evidence has shown that the mucosa of the duodenum and jejunum of normal dogs, when treated in the same manner—washed, autolyzed, and injected as above—does not affect the animal in the least. Further information has been obtained in the same matter by Davis, working on certain phases of this general problem in this laboratory. In the *Johns Hopkins Hospital Bulletin*, February, 1914, he reports a study of the secretion of the normal mucosa of the duodenum and jejunum in dogs. This secretion was collected in dogs with no obstruction, but the bile and pancreatic secretions were excluded from the bowel. Duodenal secretions collected in this way, and as nearly normal as the conditions of the experiment would permit, were found to contain the toxin, with characteristic properties.

To summarize this rather confusing array of facts: the normal mucous membrane does not itself contain a demonstrable amount of toxin, but apparently under certain conditions does secrete it, whereas the mucous membrane under

conditions of obstruction not only excretes the substance into the lumen of the bowel but also retains it within its own cells. Admittedly, we are unable to define more accurately the term "obstruction conditions." It does not mean simply retention of material in the lumen. Further, Davis, in the paper referred to, has proved that absorption, as tested by easily recognizable substances, is no better from within a closed loop than from the unobstructed lumen of normal gut—if anything, indeed, not quite so rapid. Hence we feel that the toxin within the cells of the mucosa and not that poured out into the lumen of the gut is the chief source of the systemic absorption and intoxication. There are many theories that may be advanced to account for the presence of the toxin in these cells—disturbed neurotrophic control, absence of normal mobility of the bowel wall, altered interaction of the various ferments and enzymes, etc.—that furnish a field for further research. For the present we must be content to say that under "obstruction conditions" there occurs a perversion of the physiology of the mucosa that leads to a retention or elaboration of toxin within its cells, and from this source comes the systemic absorption and intoxication.

The position taken by us, namely, that death in these cases is due to a toxin elaborated within the mucosa and absorbed from it, has not met with universal acceptance by those working in the same field of investigation. Hartwell and Hoguet (*American Journal Medical Sciences*, 1912, cxliii), in a series of experiments with simple obstruction in dogs, instead of isolated loops, showed that the animals undergo a great loss of fluid from vomiting and that life can be prolonged until starvation terminates it by supplying this deficit in water. From this and other facts they conclude that dehydration is the principal factor in producing death in simple obstruction. We do not claim that the isolated loops are identical with the simple obstructions encountered clinically. This form of attack on the problem of obstruction was chosen because it permitted the elimination of many of the possible factors that enter into simple obstruction, all of which cannot be properly

valued when complicating each other. Having found the existence of the toxin above referred to in the loop experiments, it becomes relatively an easy matter to discover whether it exists in simple obstruction cases as well. Material obtained from several cases of human obstruction, as well as from simple obstruction experiments in the dog, has led us to believe that the toxin does exist in these cases as well as in the loops. The exact relation between the two conditions, as well as the direct bearing of our experiments on the clinical problems of intestinal obstructions, will form the subject matter of a paper now in process of preparation by the present writers. Hartwell, in a recent article (*Journal of Experimental Medicine*, August, 1913), has undertaken a critical review of the work published by us on the closed loops. He admits the existence of the toxin and its causal relation to the death of the animal, but quotes from our protocols of experiments to show that the degree of intoxication is proportionate to the amount of injury and necrosis shown by the mucosa of the isolated loop at autopsy. From this he concluded that the toxin with which we have been working is not dependent upon obstruction conditions at all, but upon insult to the mucosa, and that in a simple obstruction without any lesion to the membrane of the gut no poison would be evolved; hence the toxin formation is merely incidental to the obstruction and not the primary cause of death, which he still maintains to be desiccation with concomitant tissue changes. Our best answer to this chain of reasoning is to refer to numerous experiments quoted in detail in the articles already referred to, in which closed loops resulted fatally and showed a rich toxin content both of the mucosa and the loop fluid, but in which no gross or microscopic lesion of the mucous membrane other than a moderate hyperæmia was discoverable. So often is this the case that we do not feel that demonstrable damage to the mucosa plays any essential part in its propensity to form the toxin.

We have throughout the work on this subject used the general term toxin to designate the substance or substances obtained from the isolated loops in the manner described, and

recognizable by the characteristic physiological properties. This vagueness of terminology is necessary because we have as yet been unable to obtain any accurate idea of the chemical nature of the substance or to secure it in anything like a condition of chemical purity. Certain of its properties we know. It can be heated without destruction for long periods at 60 to 70 degrees C. but boiling fresh fluid precipitates it by adsorption with other substances present in the fluid. Autolyzed fluid may be boiled without destroying the toxin. Prolonged bacterial and pancreatic digestion does not affect it.

Irrespective of the exact chemical nature of the substance causing the death of animals with high loops, the uniformity of its physiological effects suggested the possibility of developing a resistance or immunity against it. This suggestion has led to the working out of one of the most interesting aspects of the general problem, the detail of which, with full protocols of experiments, will be published shortly by the present writers. (*Jour. of Experimental Medicine*, February, 1914). In this place we shall merely outline the results obtained. It was found possible by repeated injection of sublethal doses of toxin in increasing amounts into healthy dogs to produce a marked resistance in such animals so that they could successfully withstand much more than a known fatal dose of the injected material. A study of dogs so immunized revealed the fact that the serum possessed no protective powers, but that parenchymatous organs, notably the liver, were apparently the site of the defensive adaptations. Thus aqueous extracts of liver from immunized dogs, when mixed *in vitro* with the toxic fluid, rendered the latter inert after autolysis for several hours. A similar power is exhibited by extracts of spleen, lung, and intestinal mucosa from immunized dogs when autolyzed with the toxin. From this fact has come the impression that some type of cell common to these various organs, perhaps endothelium, is concerned in the protective phenomenon. Extracts of liver from normal dogs may possess this property in slight degree. The idea at once suggested itself that the extract of immunized liver be tried on dogs suffering from the intoxica-

tion of closed loops, to ascertain whether the *in vitro* reaction could be in any degree paralleled by an *in vivo* test. Dogs were obstructed and allowed to proceed to marked intoxication when experience led us to believe that life would be terminated within a few hours. The results of these experiments will be published in detail. At this time we shall content ourselves with saying that it may be possible to prolong life by such a method. The discovery of an increasing resistance against the toxin has suggested an explanation of the results of our drained loop experiments. It will be recalled that these dogs exceed the life-period of the closed loop dogs and some have lived for long periods, others dying in five to eleven days. It is clear that the escape of loop contents by drainage eliminates a quantity of the toxin and we believe that what absorption occurs here takes place largely from the mucosa direct, without added reabsorption from material already excreted into the lumen. Hence the animal undergoes a slower and less overwhelming intoxication and has opportunity to develop some degree of immunity. The success of this defensive adaptation naturally varies with the individual animal, and thus occasionally a dog lived indefinitely, having attained a status in which it is able to neutralize the noxious product of the loop mucosa as rapidly as it is formed, whereas in other instances death is delayed a varying length of time by a defence which is inadequate, but nevertheless quite definitely observable. An interesting side-light on this question of immunity is afforded by the work of Davis, in the article previously referred to, on similar closed loops in cats. He found that cats survived much longer than dogs and finally died as a result of the distention and perforation of the loop, with consequent peritonitis. The characteristic toxin is nevertheless present and very active, killing dogs in small quantities with characteristic symptoms. The possibility of immunizing dogs suggested the idea that cats might possess a native immunity against this particular poison. The truth of this conception is borne out by the fact that Davis has failed to kill any cat even by the administration of relatively huge doses of known toxic material.

It will be observed that our experiments have been conducted upon closed loops and not upon simple constrictions of the lumen of the bowel such as are usually encountered clinically. The purpose in proceeding thus, as already explained, was to eliminate some of the complex factors that render direct study of simple obstruction too intricate a problem to control sufficiently. The next step is to determine whether the facts discovered in regard to closed loops can be carried over to apply to simple constrictions, and then to correlate our whole series of studies with the problem of clinical obstruction. It may be mentioned that a dog recovering from a simple obstruction will show a high immunity against a subsequent closed duodenal loop. The physiological properties of bowel content obtained from several cases of clinical obstruction in the human make us sanguine of proving the identity of the toxin with a toxin in clinical cases of obstruction. Whether this is the chief or only deleterious substance to be reckoned with we do not as yet know. In any case, the resemblance between our loops and certain forms of clinical obstruction, for example volvulus and the usual type of strangulated hernia, is quite apparent, and suggests that these cases present the double problem of a simple obstruction plus a closed loop. The importance of placing an enterostomy opening as close as is feasible to an unrelieved obstruction is also a corollary to our observations, as otherwise a condition resembling a drained loop may develop between the enterostomy and the obstruction. The important finding of toxin within the mucosa of the loops, even when drained, sheds light on certain clinical facts that have heretofore been obscure. It is well known that occasionally after the relief of obstruction by enterostomy or otherwise, even when peristalsis emptied out the bowel content, the patient failed to respond as one would expect and died without appreciable benefit from the drainage. If one may assume the similarity of these clinical cases to our loop experiments, it is easy to see an explanation in continued absorption from the mucosa, in a patient already so intoxicated that this continued absorption was sufficient to overwhelm him.

It is not meant to infer that drainage of the bowel is not logical and necessary; the vast array of clinical facts does not need the prolonged life of our drained dogs to prove a matter that is one of simple mechanics and common sense. But it is permissible to assume that drainage alone is not always sufficient. The escape of bowel contents voids a mass of toxic material, but there is still the toxin within the mucosa to be considered. In dealing with this we wish to give emphasis to the opinion of Hartwell and Hoguet on the importance of introducing ample quantities of fluid into the system by infusion, etc. We explain the effect of this procedure somewhat differently from its chief advocates, as we believe that it may be a dilution and increased elimination of the toxin, and perhaps the checking of a secondary dehydration caused by the toxin; whatever the explanation the method is good. But we hope that we have within our grasp a more direct defence against the perverted mucosa which we believe to be the fundamental trouble. We refer to the experiments we have made with the injection of extract of immunized liver into dogs with closed loops. While still inconclusive, our results have encouraged us to hope that we have a method of direct protection against the specific intoxication that causes death. The great value of such an adjuvant to the necessary mechanical relief of obstruction, both before and after operation, need scarcely be emphasized.

Conclusions.—In dogs one may isolate by double ligatures a loop of the duodenum and high jejunum and re-establish the continuity of the alimentary tract about the closed loop: such a condition is rapidly fatal.

The conditions of the experiment may be so controlled as to exclude circulatory disturbances, food derivatives, gastric, pancreatic, and biliary secretions as possible causes of death.

The dogs die with characteristic symptoms and present typical autopsy findings, the whole course of the post-operative disturbances suggesting an intoxication of some sort.

A fluid collects within the closed loops that is highly toxic, producing, when injected into normal dogs, a reaction much

like that of dogs with closed loops. This toxin is believed to be the cause of death.

The toxin is formed by the mucosa of the closed loop, some of it being secreted into the lumen and some remaining within the cells of the mucosa.

If the closed loops be drained externally, the post-operative course of the animal is altered, but varying degrees of intoxication still are observable, and the presence of toxin within the mucosa of the drained loops is demonstrable.

Absorption takes place not only from the loop contents but from the mucosa direct, the latter being a quite important source of intoxication.

There are various possible explanations for the perversion of function that causes the mucosa to become a source of intoxication, but none are yet proved. The fundamental explanation of the change is as yet unknown.

It is possible by the repeated injection of sublethal amounts of the toxin to immunize dogs against fatal doses.

The parenchymatous organs, spleen, intestinal mucosa, etc., and particularly the liver, seem to be especially concerned in the production of the resistance against the toxin when dogs are immunized.

The extract of an immunized dog's liver, properly handled, will destroy the toxin *in vitro*.

We believe that the intoxication observed in closed loops is quite similar to that existing in simple obstruction, and that the same toxin is the essential agent causing death in each instance.

The discovery of the importance of absorption from the mucosa even in drained loops leads one to think that the establishment of an enterostomy for drainage in clinical cases may not meet all the requirements for successful treatment.

It may be possible to develop a method of direct defence against the toxin, as an auxiliary to the surgical relief of obstruction conditions.

SARCOMA OF THE SMALL INTESTINE.*

BY JOHN SPEESE, M.D.,

OF PHILADELPHIA, PA.

Instructor in Surgery and Surgical Pathology, University of Pennsylvania.

THE clinical and pathological aspects of sarcoma of the small intestine have been thoroughly reviewed in the comprehensive papers of Baltzer, Rheinwald, Lecene and Libman. While little can be added to their conclusions, the writer desires to report two new cases and to summarize the results of operation in the large number of cases which are now on record.

A statistical review of sarcoma of the intestine proves the rarity of the affection, as Baltzer in 1894 was able to collect 14 cases, Libman 59 cases in 1900, and Lecene 89 cases in 1904. The autopsy records in various large hospitals also confirm the view that sarcoma is infrequent in the intestinal tract, especially when compared with carcinoma. Nothnagel found 243 instances of carcinoma of the intestine in 2124 autopsies on cancer cases, while of 243 sarcomata but three were in the bowel. Smoler in 13,036 autopsies found 13 cases of primary sarcoma of the small intestine. Sarcomata of the large intestine, excluding the rectum, are much less common. Of Krueger's cases, 16 occurred in the small intestine, 6 in the large intestine and 16 in the rectum. Jopson and White, in 1901, found 22 cases of the large intestine, whereas Libman's paper appearing a year earlier contained 59 cases of sarcoma of the small intestine.

Sarcoma of the small intestine does not appear to affect any particular age, although Baltzer found that the majority of his cases occurred in the fourth decade. The 75 cases in which the age is mentioned may be divided as follows: 1-10, nine; 10-20, ten; 20-30, seventeen; 30-40, eighteen; 40-50, fourteen; 50-60, five; 60-70, two.

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The rather large number of cases occurring at an early age is a fact of much interest. The tumor in Stern's case was present at birth and caused intestinal obstruction from which the child died. In addition to this instance, sarcoma of the intestine has been observed in children of five and six years of age for which successful operations have been performed (Power, Barling, Zwahlenburg).

Any portion of the small intestine may be the seat of a primary sarcoma. The following is an analysis of 53 cases in which the part involved is mentioned. As many of the case reports merely state that resection of the small intestine was performed, they could not be included. Duodenum and jejunum, 3; jejunum, 12; jejunum and ileum, 2; ileum, 32; entire intestinal tract, 4.

All writers on the subject mention the predisposition of the male sex in intestinal sarcoma. Adding the cases which I have collected to Lecene's we find of 101 instances, 67 occurred in males and 34 in females, or practically twice as many in the male sex.

As lymphosarcoma constitutes one of the chief types of intestinal sarcoma and as such growths tend to spread early to the neighboring lymphatic nodes, the mesentery of that portion of a bowel in which the sarcoma arises is involved frequently. In 45 autopsies 34 (75 per cent.) instances of mesenteric involvement are recorded by Lecene, a fact demonstrating the importance of thorough removal of the mesentery of the affected bowel. On the other hand metastasis to the superficial lymph-nodes or those in the retroperitoneum or mediastinum is rare.

Involvement of practically all the abdominal viscera has been noted in advanced cases, although the liver and kidney are especially liable to metastatic deposits. Direct extension to the peritoneum of adjacent viscera is quite common, and at the time of operation several loops of gut may require resection. Involvement of the bladder is met with frequently because the tumor in many cases occupies a pelvic position.

The histological variety of sarcoma is of great interest in

connection with the question of metastasis. The majority of recurrences or metastases have arisen in lymphosarcoma or in the round-cell variety. The spindle-cell sarcoma, on the other hand, has a pronounced tendency to remain localized. This fact is explained partly by reason of the stenotic action such tumors exert on the intestine, in consequence of which the indications for early operation arise before marked extension can occur.

The association of single traumatic insults has long been held important in the development of sarcomata in general. The numerous instances recorded by Coley, Lowenstein and others support this view. It is not surprising, therefore, that such a factor is mentioned in some of the reported cases and is of particular interest, as the disease occurs much oftener in the working class. Zwahlenburg records an abdominal injury in a boy aged five; six weeks later a tumor one inch in diameter was noted at the site of injury. Nothnagel observed a case of lymphosarcoma developing on the base of an old tuberculous ulcer. The association of tuberculosis and lymphosarcoma elsewhere has been observed and is regarded as an accidental association. Three cases of sarcoma have been reported to have occurred in the ileum years after severe attacks of typhoid fever. Firth noted an instance developing five months after an operation for strangulated hernia. Syphilis has also been present in several cases.

From these factors of more or less etiological importance, we are unable to draw any conclusions which might throw light upon the cause of intestinal sarcoma.

Kasemeyer has investigated very thoroughly the subject of intussusception caused by tumors, and has collected 284 cases, of which 85, or 30 per cent., were caused by malignant formations. Of these 85 cases, 57 were carcinoma and 26 were sarcoma. The symptoms of intussusception as seen in children, the severe abdominal pain, vomiting, bloody and mucous stools, are seldom present in intussusception secondary to tumor formation. In such cases a chronic course is pursued and the symptoms extend over months even with an

intussusception present, as is demonstrated by the dense adhesions about the bowel or by extension of the invaginated tumor to the intestinal wall with which it comes in contact. The infrequency of complete obstruction following tumor intussusception is explained by the fact that the infiltrated intestinal wall undergoes dilatation.

Tenesmus may be the chief symptom complained of, but is as inconstant as is meteorismus and abdominal tenderness. The presence of a sausage shaped tumor, the situation of which varies, along with other symptoms of chronic intestinal obstruction, has been regarded as distinctive of tumor invagination by several observers, and the diagnosis correctly made (Ewald, Kasemeyer).

Many varieties of sarcomata have been observed in the intestine; the 99 cases in which the type is mentioned are divided as follows: Lymphosarcoma, 34; round-cell sarcoma, 43; spindle-cell sarcoma, 13; fibrosarcoma, 3; mixed-cell sarcoma, 1; myxosarcoma, 2; myosarcoma, 2; melanotic sarcoma, 1.

The lympho- and round-cell sarcomata greatly predominate. Many cases diagnosed as round-cell sarcoma probably belong to the lymphosarcoma group, but the histologic descriptions are too incomplete and indefinite in many cases to make the classification correct.

The tumors in the majority of cases originate in the submucous tissues (lymphosarcoma) or in the connective tissue of the muscularis or perivascular region, and in some instances reach a considerable size without producing any ulceration of the mucous membrane. They may extend parallel to the long axis of the bowel, producing a gradual infiltration of all the tissues but not causing stenosis. The bowel above the area of infiltration frequently undergoes dilatation and resembles an aneurism; the lumen of the intestine, in such cases, is filled with necrotic tumor tissue, pus and fecal material. Dilatation of the intestine is seen in the round-cell and lymphosarcomata, whereas stenosis and obstruction result from the fibrosarcomata. In exceptional cases the tumor extends

through all the coats of the gut, gradually involving neighboring coils and forming a large adherent mass. The tumor may be single or multiple; in the latter event the growths appear as plaques or small nodules under the mucosa. The single tumors, especially if pedunculated, are singularly prone to produce intussusception, although this complication has developed in the infiltrative types of tumor.

Marked variations exist in the size of the tumors, although as a rule the growth has reached considerable proportions before the diagnosis has been made or the operation performed. The shape is spindle, the contour irregular and the consistency firm in most cases.

Although partial occlusion of the bowel is present in about one-half of the cases complete stenosis practically never develops from the mere presence of the sarcoma. Even in large tumors encroaching upon the intestinal lumen, a narrow passageway can be demonstrated, thus explaining the chronic intermittent symptoms of intestinal obstruction. When complete occlusion occurs and is followed by the symptom of ileus, the condition is caused by adhesions or by an intussusception.

Sarcoma of the small intestine manifests itself in the beginning by symptoms of an indefinite nature. In the majority of patients generalized abdominal pain is first noted; this is followed by loss of appetite, nausea, vomiting, the bowels are irregular, diarrhoea alternates with constipation, and distention of the abdomen soon follows. The patients are very thin, pale and weak, when first seen. Moderate elevation of temperature and slight leucocytosis may be present. Unless the acute obstruction is due to kinking of the intestine or to an intussusception, complete constipation is unusual, although repeated attacks of obstinate constipation may be complained of. Baltzer and Nothnagel both asserted that apart from complications, sarcoma of the intestine does not produce symptoms of stenosis. This view has been disproved by subsequent articles, in which it has been shown that at least 55 per cent. of the cases do have symptoms indicative of some degree of in-

testinal obstruction, but the course is not similar to the stenosis caused by cancer of the bowel. When carcinoma produces an obstructive lesion, the course is generally a protracted one and the patient's loss of strength and weight is slow and gradual. Sarcoma, on the other hand, causes rapid loss of weight, the disease rarely lasting over a year and the average duration, according to Rheinwald, being four to five months.

A careful study of the histories of many cases shows that attacks of constipation and diarrhoea are common, although these symptoms are wanting in a small proportion of the cases. It is also worthy of note that in many instances vague intestinal disturbances are the earliest symptoms noted, and that operation performed a few weeks or months later will often reveal a larger or even inoperable sarcoma.

Blood in the stools has been present in a small proportion of the cases, and is sometimes one of the earliest symptoms mentioned.

In a few instances the patients have noted the presence of a tumor. This on examination varies considerably in size, the surface is smooth and nodular, and unless seen quite late, the growth is freely movable. Its consistency is as a rule dense and hard. In late cases metastatic nodules are palpable and the primary growth demonstrated with difficulty.

As the result of pressure of the tumor on the intestine, distention may result, and pressure on the vessels may produce ascites, or œdema of the legs, distention of the veins of the abdominal or thoracic walls, jaundice, dysuria or diminution in the amount of urine (Libman). Examination of the blood shows merely a secondary anæmia.

Libman has classified the varieties of the disease as follows: (1) Latent cases, the disease being first discovered at autopsy. (2) Cases with the clinical picture described by Baltzer, either the general symptoms, the distention of the abdomen, or the tumor being first noted. (3) Cases in which the first symptoms are due to an intussusception or other variety of intestinal obstruction or to perforation. (4) Cases resembling tuberculous peritonitis. (5) Cases in which jaun-

dice is the first symptom. (6) Cases resembling ovarian cysts. (7) Cases bearing a close resemblance to appendicitis, an observation noted first by Libman and described in several reports since that time.

An early diagnosis in these cases seems impossible because the symptoms are so mild and transitory in the beginning. When, however, a tumor is discovered, freely movable, producing pressure symptoms of a mild type, with the absence of severe obstruction symptoms, sarcoma of the small intestine should be suspected.

The treatment of intestinal sarcoma is of course surgical, although in inoperable lymphosarcomata benefit has been followed by the administration of arsenic. Libman recommended its use even in cases in which successful resection of the intestine has been performed.

For a long time sarcoma of the intestine was regarded as almost invariably fatal. This view is not sustained by an analysis of the cases reported in the past decade, in a large number of which many years have elapsed without recurrence since the time of operation. The vague nature of the symptoms delays operation, although a palpable tumor is almost invariably present at the time of operation and a history of a chronic intestinal disturbance can be obtained in the majority of cases.

The number of resections of the small intestine for sarcoma is 75; of these 15 are collected by Zwahlenburg, 37 by Moynihan, 6 by Lecene, 17 by Speese. There were 55 recoveries (74 per cent.), and 19 deaths following operation. Nine instances of recurrence are noted, the periods varying from three months, 5 months (2), 12 months (2), 15 months. The cases in which recurrence arose in 7 instances were diagnosed as lymphosarcoma or round-cell sarcoma, thus emphasizing the malignant nature of this variety; one case of myxosarcoma recurred.

When the infiltration of the bowel is too extensive for removal or metastasis has occurred, the abdomen should be closed without further exploration. If stenosis is present some sur-

geons advise an artificial anus to relieve the immediate and urgent symptoms.

The large number of intussusceptions noted in the series is a matter of considerable interest and importance. In 14 of the 74 resections, this complication was encountered. Ten of these 14 cases recovered, 1 died immediately after operation, and 3 from recurrence. The type of tumor has no influence upon the development of an intussusception, for the complication has occurred in the round-cell, the lymphosarcoma and other forms. A pedunculated tumor may predispose to invagination, but it also follows cases in which the intestinal wall is extensively infiltrated by the tumor.

The amount of small intestine resected in the majority of cases is from 10 to 40 cm. Barclay removed 190 cm., and Storp 510 cm. of the bowel. In the former case the patient suffered from frequent and liquid stools, and in the latter no metabolic or other disturbances were noted.

The effect of the removal of large amounts of small intestine has been investigated experimentally by Flint, whose conclusions are of great importance in view of the radical measures which may have to be undertaken in some of the cases. It was found that in dogs as much as 50 per cent. of the total intestine may be removed without fatal results, and the animals may gradually return to a condition of practically normal weight and metabolism when maintained on a favorable diet under good conditions. Resections of 75 per cent. or more of small intestine may be survived, but such animals do not show a return to normal weight with the establishment of a good compensatory process.

Animals at first suffer from a severe diarrhœa, ravenous thirst and appetite, and loss of weight, from which they gradually recover until conditions may return to those of a normal animal. They remain extremely sensitive to unfavorable conditions of diet and living.

The compensatory process consists in a hypertrophy and hyperplasia of the remaining portion of the small intestine. There is no regeneration of villi or crypts.

Human cases behave in general like animals and show similar metabolic disturbances. There are over 58 cases in the literature in which over 200 cm. of small gut have been resected. The mortality is 16 per cent., which is lower than it should be, as only the successful cases have probably been reported. Metabolic disturbances in human beings bear no definite relationship to the amount of small intestine resected.

Resection of over 400 cm. of intestine has been followed by recovery, while death from inanition has resulted from resection of 284, 289, 300, 380 cm. respectively.

Profound digestive disturbances have resulted from removal of 192 and 204 cm. of ileum.

Progress in human cases should be guarded. Apparently successful resection may, for lack of suitable compensation, succumb ultimately to a slow process of inanition. Experiments and series of human cases emphasize the fact that neither the stomach nor the colon is able to compensate for the loss of large portions of small gut.

The writer desires to express his thanks for permission to report the following cases, operated upon by Dr. John B. Deaver at the University Hospital.

Male, aged fifty, has been suffering with hemorrhoids for several years and for the past several weeks has complained of constipation, distention of the abdomen, severe cramps and vomiting. The constipation was relieved by enemas and laxatives, the resulting movements were as black as ink, although free blood was not noticed. He has had successive attacks of pain, tenderness and obstinate constipation. The mass was not discovered until the time of examination, seven weeks after his symptoms began. The examination disclosed a round mass in the right lower quadrant of the abdomen. The tumor is tender, regular in outline, and is movable.

Blood examination, red blood cells 4,980,000, polynuclears 70, white blood cells 9,800, lymphocytes 20, hæmoglobin 100, mono-leucocytes 0, transitionals 1, eosin 0.

Examination of the fæces for occult blood was negative.

Operation.—A large mass about the size of an orange was

found in the ileum about 3 feet from the ileocaecal junction. The ileum was resected with its corresponding portion of mesentery, and end-to-end anastomosis was performed. Five days after the operation the patient developed a fecal fistula; this was followed by peritonitis, from which he succumbed eleven days after the operation.

Pathological Examination.—The specimen consists of 57 cm. of ileum. The intestine at one area contains a globular mass 8 cm. in diameter, the wall of the intestine is enormously thickened, measuring 3 cm. The section through this thickened portion shows that the intestinal mucosa is greatly ulcerated and that the lumen of the bowel is represented merely by an irregular area of ulceration through the centre of the tumor mass. At one point the lumen is almost completely occluded by the tumor tissue (Fig. 1). The tumor mass, as represented by the greatly infiltrated wall of the intestine, is composed of firm whitish tissue which is completely surrounded by the serous coat of the intestine. In the mesentery several enlarged nodes having the same characteristics as the primary tumor are found.

Microscopic examination shows a very cellular formation composed of small, round, deeply staining cells, having a fairly uniform appearance. The stroma is composed of thin fibrils which ramify between the tumor cells, which extend to the mucosa and infiltrate and destroy the intestinal glands. The structure of the muscular coats of the intestine is completely obliterated by the cellular infiltration. The tumor contains very minute areas of necrosis and is fairly well supplied with new blood-vessels. The lymph-nodes removed from the mesentery show a similar involvement.

Diagnosis.—Lymphosarcoma.

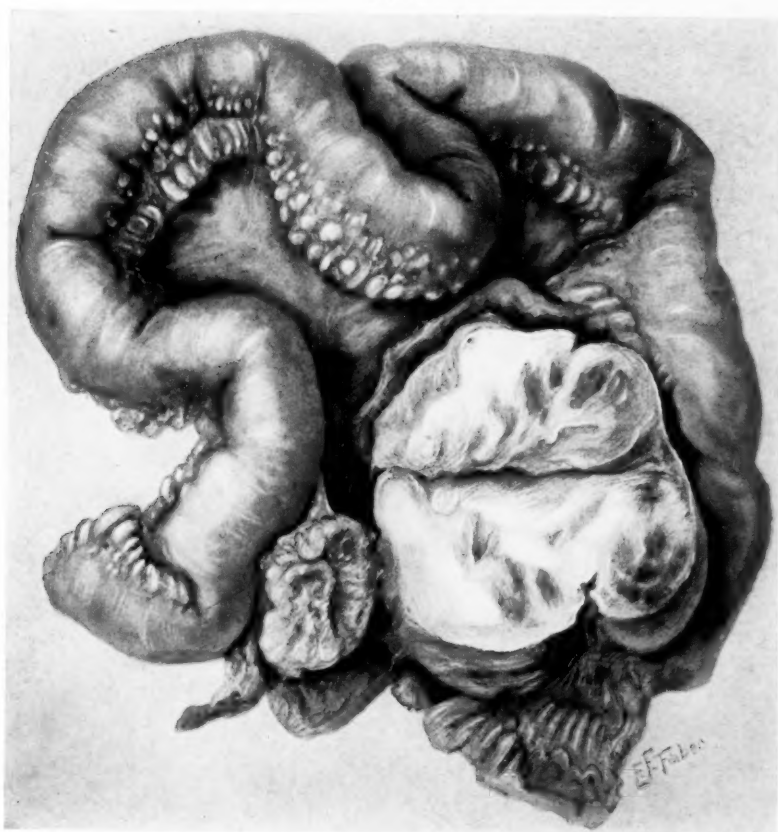
Female, aged fifty-seven, was admitted to the University Hospital complaining of pain in the abdomen. Her past medical history is unimportant. One sister died of cancer of the stomach. Her present illness began one month before her admittance, when she was suddenly seized with agonizing pain in the abdomen. The pain was localized to the region of the umbilicus; the attacks were accompanied by vomiting. The attack lasted twenty-nine hours. The patient recovered and was well for a period of three weeks, when the pain again returned. The pain has been persistent, is constantly localized to the region of the umbilicus; the bowels are regular; there has been some distention of the abdomen. On examination a mass the size of a grape fruit is palpable in the lower and middle portion of the abdomen. The upper limit of the tumor is about one inch below the umbilicus.

FIG. 1.



Lymphosarcoma of intestine showing partial occlusion of the lumen.

FIG. 2.



Myxosarcoma of mesentery.

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The mass is smooth, round and slightly movable. Red blood cells 3,710,000, polynuclears 70, white blood cells 20,000, lymphocytes 23, hæmoglobin 60, monoleucocytes, 3, transitionals 4, eosin 0.

Operation.—On opening the abdomen a mass was found in the mesentery, in the midline; the surrounding coils of intestine were attached to it by adhesions. The coil of ileum which surrounded the tumor and the mesentery were excised and a lateral anastomosis formed. A supravaginal hysterectomy was performed for a large subserous fibroid tumor. Recovery; no evidence of recurrence three months after operation.

Pathological Examination.—The specimen consists of a tumor which is surrounded by a loop of small intestine, which measures 80 cm. in length. The tumor, which measures 8 cm. in diameter, is situated near the base of the mesentery and is attached to the intestine for a distance of a few centimetres only. The wall of the intestine appears normal and is not compressed by the tumor mass. On cross section the tumor is soft in consistency, the cut surface for the most part is white and contains numerous reddish areas and small points of necrosis.

On microscopic examination the growth for the most part is composed of tissue containing large stellate cells. The connective tissue in these areas is of very loose texture, and contains within its meshes a homogeneous substance taking a faint blue stain. Large numbers of blood-vessels with thin walls are present. A considerable amount of free blood is found in the fibrous tissue. In addition to the stellate cells mentioned, there are many areas in which large numbers of cells are closely packed together, the cells being spindle in type, some are large, some small and many being arranged around the blood-vessels. Minute areas of necrosis are encountered, and in these situations leucocytes are found between the tumor cells. Many nonstriated muscle fibres are seen in the more superficial portions of the tumor.

Diagnosis.—Myxosarcoma of mesentery.

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THE SURGICAL TREATMENT OF ACUTE GONORRHOEAL EPIDIDYMITIS BY EPIDIDYMOTOMY.

BY J. BAYARD CLARK, M.D.,

OF NEW YORK CITY.

Assistant Genito-Urinary Surgeon, Bellevue Hospital.

ALTHOUGH in the hands of a few genito-urinary surgeons epididymotomy has become the treatment of choice in acute gonorrhœal epididymitis, it has not as yet reached as full an appreciation as the operation seems to warrant. It is an axiom of surgery to-day, that when the function of an organ is threatened by the invasion of pus-producing organisms, prompt incision and drainage are indicated.

During the past five or six years, I have been doing this operation as described by Hagnar, of Washington, on only such of those cases as have come under my care, having unusually severe pain, with considerable swelling and high temperature. In all of these cases the results were so satisfactory that I was led to the idea of applying this treatment consecutively to all the acute cases during two and a half months last summer, when I had the care of the service at Bellevue Hospital, with which I am connected.

The astonishingly happy outcome of this experiment, as far as immediate results were concerned, seems to justify a short review of the methods employed in this small collection of twenty-one successive cases. It gives me pleasure to acknowledge the assistance and valuable suggestions of Dr. George F. Cahill, of the house staff, who did this work with me, and who deserves much of the credit for putting this small operation on a technically simpler basis than it has, I think, previously enjoyed. It is on account of the simplicity of this operation and its apparent freedom from risk, also the firm conviction that the course of the disease is shortened and the liability of sterility is lessened, that I am here adding a record of my experience to the list.

The frequency with which this complication of a gonococcus infection occurs, its obvious diagnosis, the distracting character of the pain, the attending fever, its debilitating and often protracted course, the unsatisfactory nature of medical treatment and the considerable percentage of following sterility are all so well known and so well described in standard text-books, that there is no need for repetition here. The simple method we employed was as follows:

The patient was prepared for an ether anæsthesia. Just as soon as the patient was lightly under, the operative field was sterilized with 2½ per cent. tincture of iodine, and an oblique incision, 1½ inches long, was made downward and forward over the epididymal swelling, which in our series of cases occurred uniformly in the globus minor. With the oblique course of our incision it was possible to avoid most of the small vessels in the skin and thus get very little bleeding.

The incision was carried down to the tunic vaginalis, which was opened to the length of the skin incision and the fluid, which was usually present, drained off. The edge of the tunic was picked up on both sides with hæmostats, which acting as retractors bared the swollen and congested epididymis; its thickened fibrous covering was incised for one-half inch over the prominence of the swelling and a probe gently passed into the substance of the epididymis, in several directions. If suppuration had occurred, the pus was in this way easily found and drained off. In all cases relief of tension was effected and drainage established.

The most important element in this operation is the lack of traumatism, as the testicle is not delivered or the parts bruised from handling. In that smaller percentage of cases where the body of the epididymitis or the globus major is involved, a freer incision and possibly a turning out of the testicle will be found to be best, but the special point of this paper is to show how little of an operation is necessary in the great majority of cases, and the little excuse there is to allow these patients to suffer the pain, the slow convalescence and possibly sterility for want of a prompt decision in draining this dependent point of infection.

A wick made of rubber dam was gently placed in the substance of the epididymis, where the probe found least resistance, or into the cavity made by the accumulation of pus, if pus was present.

In 33 per cent. of the cases pus was present. The gonococcus was the only organism found. One or two catgut sutures were then used to draw the deeper structures together, and two or three silk-worm sutures closed the skin except for about a half inch opening through which the drain emerged. The time of operation was usually from five to ten minutes. A generous dressing was held in place by an Alexander suspensory.

The immediate relief from pain and the decline in temperature was the pleasing aftermath of each operation. In forty-eight hours the drain was removed and the parts so exquisitely tender before operation could be handled without discomfort.

On the fourth or fifth day the patients were allowed up, and on the fifth or sixth day the stitches were removed and the patient allowed to go out.

This form of treatment is indeed in striking contrast with the older methods, where the patient lies in bed with his scrotum resting on a supporting bridge, stretched between the thighs and surmounted by heat, cold or chemicals, wincing at the approach of attending hands and patiently waiting, while the severity of pain was dulled by anodynes, the slow restitution of the swollen gland.

It is difficult as yet to tell the end value of this little surgical procedure, which secures such immediate relief. What is radical to-day often becomes conservative to-morrow. We may hope as much for this way of dealing with acute epididymitis, for with practically no risk, it saves a deal of suffering and lost time in tedious convalescence.

It is impossible with the class of patients dealt with at Bellevue Hospital to hope for co-operation in the after-study of these cases.

The pathology of the condition as it exists and as it is dealt with expectantly is well known and equally unsatisfactory. To get the relative value of the newer way of dealing with this complication, must needs take patient and scientific study over a period of subsequent years.

In a paper read by Cunningham, of Boston, before the American Association of Genito-Urinary Surgeons in Wash-

ington, last spring, of his series of cases he reported having operated bilaterally on six. Two of these patients have married and each of them has had two children. This is interesting as not only showing potency, but the fact of their having had two children is evidence that they probably did not infect their wives. Two others of these six cases showed numerous living spermatozoa in condom specimens collected at coitus; but no spermatozoa were seen in specimens collected by massage of the seminal vesicles and prostate. The remaining two had had no sexual intercourse and the specimens collected by massaging the seminal vesicles showed no spermatozoa.

With the knowledge we have at hand it seems unlikely that this operation, when properly done, that is without further destruction of the tissue than the disease has already effected, cannot but shorten the course of the pathological process and bring to the organ a better chance of ultimate recovery. Whether the organisms are recovered from the exudate which nature has produced by her processes and which we release by the knife, is of very little moment.

The real question is, do we lessen or obviate by epididymotomy that sequel of the disease, which so often leaves the testicle with the pathways of its spermatozoa blocked—in permanent bondage?

TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, held January 5, 1914.

DR. GWILYM G. DAVIS, President, in the Chair.

TUBAL PREGNANCY.

DR. A. D. WHITING reported the following case:

L. L., a white female aged nineteen, was admitted to the Germantown Hospital, November 22, 1913. Her history states that she was married when 15 years of age and that she gave birth to a normal child 3 years ago. Her menstrual history dates back 7 years. Her menses were regular but very painful and the flow was always profuse. Her last menstrual period started April 7, 1913, and lasted 4 days, being normal in every respect. There has been no vaginal bleeding or discharge of any character since that time. She began to have the nausea and vomiting of pregnancy in May and also had pains in the lower abdomen which were intermittent in character. These were similar to pains she had had while carrying her first child, although she thought them more severe. Fetal movements had been felt for more than two months before admission and had been unusually severe and painful on the day of admission. The patient had noticed practically no difference between this pregnancy and her former one and had made arrangements for her delivery in January.

At 11 A.M., November 22, 1913, after returning home from shopping, she made and ate a sandwich which she says caused marked nausea followed by vomiting and retching and severe pains, of a lancinating character, in the lower abdomen. She became faint and felt very cold, weak, and thirsty. She drank considerable water, which she immediately vomited. The symptoms continuing, her physician, Dr. Sutliff, was called. He immediately sent her to the hospital as a case of concealed hemorrhage.

On admission, the lips and conjunctivæ were blanched, the skin was pale, the breathing was rapid and shallow, the pulse was thready and too rapid to be counted accurately. Patient complained of extreme thirst, was very restless, and showed great excitement in her facial expression.

Examination revealed a large, rounded mass extending from the pubes to above the umbilicus slightly to the right of the median line. Percussion elicited dulness over the entire right side of the abdomen, present but not so marked on the left side. Vaginal examination revealed an enlarged uterus with a soft cervix. The fundus could not be distinguished; the uterus seemed to be continuous with the abdominal mass, which moved freely with the cervix. There was no vaginal discharge. No fetal movements could be felt; fetal heart sounds could not be heard. The temperature was 97° F.; respirations, 48; pulse rate approximately 160. A diagnosis of internal hemorrhage was made and immediate operation advised.

Operation at 3 P.M., November 22, within 4 hours after the onset of the alarming symptoms. Under ether anæsthesia, an incision was made through the right rectus. The right iliac fossa was filled with an enormous blood clot, while clots and fluid blood almost filled the peritoneal cavity. Rapid removal of the blood allowed an examination of the tumor which presented. It was found to be a globular mass springing, apparently, from the right broad ligament and containing a hard, irregular body. It was freely movable; there were no adhesions between it and any surrounding structure. On its surface were many broad, flat ribbon-like vessels, one of which was bleeding freely but without pulsation. The tumor was attached to the right broad ligament and to the right cornu of the uterus by a short portion of the right fallopian tube; the right ovary was to the right and below; the fundus of the uterus was below and to the left; both ovaries and the left tube were apparently normal. The right tube had apparently entirely disappeared in the tumor.

The broad pedicle of the tumor was ligated and the tumor removed. The abdomen was flushed with hot saline solution and the wound was closed in tiers without drainage. Two thousand c.c. of salt solution were given intravenously during the operation and one-half grain morphia was administered hypodermically.

The patient reacted well from the operation. Examination of

the blood twenty-four hours after admission showed a hæmoglobin of 21 per cent.; red blood cells, 2,460,000; and white blood cells, 18,600. The temperature rose to 101.6° F. after the operation and continued between 99.6° and 103° for 15 days, although no cause for the continued fever could be found. The wound healed without infection; the lungs remained normal; there was no cardiac complication; there was no phlebitis; there were no signs of peritonitis. Forty-eight hours after operation the patient expelled from the vagina a mass that seemed to be a cast of the inside of the uterus. With this exception, there was no uterine discharge. At 5 P.M. on the fifteenth day after operation the temperature was 103° F.; at 5 A.M. on the sixteenth day, it registered 98.6°, and remained between 98° and 99° until the patient was discharged from the hospital on the twenty-eighth day after operation.

The tumor weighed, immediately after operation, 3670 grammes and measured 68 cm. in its longest circumference. An X-ray picture revealed the bony structure of a well-developed foetus.

Study of the specimen after it had been opened and hardened in formalin solution gives the following findings. The gestation sac is, in part, membranous and in part occupied by a thick, friable, spongy mass, evidently placental tissue. The sac varies in thickness from 0.1 cm. in the thinnest membranous portion to 4 cm. in the thickest part. The foetus measures 40 cm. in length. It is a well-formed female covered with vernix caseosa and in no ways differs from the usual normal foetus. The cord, which is 55 cm. long, is not attached immediately to the placental area, but is inserted into the membranous portion of the sac at a distance of about 3 cm. from the placental margin. From the insertion of the cord a number of large, thin-walled, tortuous vessels radiate in all directions and ultimately find their way to the placental area. Some of the vessels leading from the cord run on the inner aspect of the sac and some on the outer. One of the external vessels presents a small rupture of its thinned-out wall.

Microscopic examination of a section through the thin membranous portion of the gestation sac shows stratified fibrous structure rather well vascularized and lined internally by the amnion. There is no apparent muscular tissue in this portion of the sac.

Microscopic examination of a section through the thicker area shows typical placental tissue of the later months of preg-

nancy, which is implanted upon a thick lamellar structure composed chiefly of concentric layers of fibrous tissue in which can be seen what are apparently bundles of smooth muscle. The attachment of the placenta to this fibromuscular wall is not an immediate one, but is obtained through the medium of a layer of large vesicular cells which bear considerable resemblance to decidual cells. This layer varies in thickness in different portions and in some parts spreads out into thin strands which are themselves separated by fibrous bands.

Dr. Whiting remarked that this case was of more or less interest on account of the length of gestation; and on account of the termination, rupture of the vessel on the outer aspect of the wall of the gestation sac without any rupture of the sac wall. The absence of symptoms of tubal pregnancy might be noted, as well as the perfect freedom of the tumor within the abdominal cavity, there being no restriction other than its attachment to the broad ligament and the cornua of the uterus.

Although Tait, in his memorable articles on the subject of tubal pregnancy, claimed that primary rupture of the sac of a tubal gestation occurred at or before the fourteenth week, numerous cases greatly exceeding this period, without rupture, have been recorded. The average length of tubal gestation, without rupture or the expulsion of the embryo through the fimbriated extremity, however, is much less than that recorded in this case. Thus Webster quotes Henning as having reported 95 cases of tubal pregnancy in which rupture occurred in 80 per cent. before the sixth month. In this series of cases, 1 ruptured in the sixth month; 1 in the seventh; 6 in the eighth; 1 in the ninth; 9 in the tenth, and 1 beyond the tenth month. In Von Schrenk's 141 collected cases, in Schauta's 87 cases, and in Mackenrodt's 38 cases, rupture took place in every instance before the expiration of the fourth month (quoted by Webster).

At the German Hospital, during the last ten years, there have been 128 cases of tubal pregnancy. Operations in these cases were performed by Dr. J. B. Deaver, to whom he was indebted for the privilege of citing them, by Dr. G. G. Ross or himself. In 99 of these patients, rupture through the wall of the tube had taken place; in 10 the products of gestation, in whole or in part, had been expelled through the fimbriated extremity; and in 5 there had been bleeding from the fimbriated extremity at or before

the time of operation. Fourteen cases were operated upon before rupture or bleeding had taken place.

Among the cases that ruptured, aborted, or bled from the fimbriated extremity, the catastrophe occurred in 3 during the first month; in 57 during the second month; in 30 during the third month; in 13 during the fourth month; and in 2 during the fifth month. In 9 cases the period of gestation was not stated.

In a very limited search through the literature of tubal pregnancy, he was unable to find any reference to a termination similar to that recorded in this case. In all of the cases noted, there was rupture of the sac wall; expulsion through the fimbriated extremity; or free bleeding from the fimbriated extremity without expulsion of the gestation products. In this case there was a rupture of the wall of one of the ribbon-like vessels without any discoverable rupture of the sac. This rupture was possibly caused by traumatism during the violent vomiting and retching, although the vomiting may have been due to the ruptured vessel and not to the sandwich, to which the patient attributed it. If caused by the marked activity of the foetus on the day of the rupture, it is probable that some signs of internal violence would have remained or that the sac itself would have been ruptured. Possibly the vessel had reached the extreme limit of stretching and could not be thinned out any more.

RECURRENT STONES IN THE URINARY BLADDER.

DR. HARRY P. CARMANY, in presenting this case, said that he had reported it before to the Academy in 1911 as one of a rather large stone removed by spinal anæsthesia. At that time cystoscopy was ineffectual on account of size of stone, although sounding and X-ray discovered it. He was admitted to St. Timothy's Hospital October 11, 1911. He was fifty-eight years old. On admission complained of frequent urination and a sense of burning in perineum. Sound revealed stone, X-ray confirmed it. Removal under spinal anæsthesia; was in hospital 49 days, when he was discharged cured. He remained well until June, 1913, when he again began to have frequent urination and burning in perineum; July 10, 1913, he was again admitted to the hospital with a distended bladder. His condition was such that little time was consumed trying to pass instrument, and suprapubic drainage was immediately decided on. He was given chloroform, as his

cough was still present which had determined the use of spinal anæsthesia at the first operation. On opening his bladder, a calculus was forced out and on examination another one was found loose in bladder and yet another impacted in the posterior urethra.

DR. ALFRED C. WOOD said, in regard to the re-formation of stones, or stones thought to have been overlooked at the time of operation, if a patient has some obstruction to the emptying of the bladder, either prostatic or urethral, and particularly if he has infection of the urine with ammoniacal decomposition, stones may form in a comparatively short time. Also in a certain number of cases there may be stone lodged in the ureter which later coming down forms a nucleus for a larger stone. He recalled one case in which during a suprapubic lithotomy, after removing a great many stones, four ounces in all, one was found projecting from the ureteral orifice. This was removed, when another was felt and removed, and so on until five had been delivered from the lower end of the ureter. If these had not been discovered they might later have appeared in the bladder and given the impression that they had been left from the previous operation.

DR. JOHN SPEESE said that about three years ago he operated upon a boy two years of age, and removed three stones from the bladder by the suprapubic method. The boy returned to the Children's Hospital several months ago with renewed symptoms of vesical calculus, and another stone was removed by Dr. Wharton. The calculi removed at the first operation were phosphatic, octagonal in shape, smooth, and each was about the size of a small hickory nut. The stone removed at the second operation was about the size of an almond, mulberry in appearance and was composed of urates. After complete recovery symptoms of a stone in the kidney developed, and an X-ray corroborated the diagnosis.

Such a case demonstrates the possible recurrence of vesical calculi at an early age, although the subsequent history of a kidney stone points to this organ as the point of formation of the vesical calculi.

DR. ADDINELL HEWSON, in connection with the stones not being found, said that some years ago he found in a man whose history he obtained subsequently, eighty years of age, who came from an almshouse in the interior of the State, a completely

encysted mulberry calculus about the size of an ordinary thimble, completely walled off from the bladder. It was just behind the symphysis pubis. The man had complained of no symptoms whatever of stone.

SARCOMA OF THE SMALL INTESTINE.

DR. JOHN SPEESE presented a paper with the above title, for which see page 727.

DR. JOHN H. JOPSON remarked that in 1901, Dr. C. Y. White and he reported a case of sarcoma of the large intestine in a child of four years. They collected, as Dr. Speese had mentioned, 22 cases of sarcoma of the large intestine above the rectum, all that they could find in the literature at that time, and they excluded all cases in which there was not a reasonable certainty that the process was primary in the large bowel. Shortly before this Libman had collected 59 cases of sarcoma of the small intestine, and the difference in the number of cases in his series and in theirs represents fairly accurately the comparative percentage of frequency of sarcoma in these two portions of the intestine.

In the rectum sarcoma is more frequently met with than in either the large bowel or the small intestine, but its symptoms do not differ materially from carcinoma of the rectum; whereas, in the remainder of the large intestine, namely, the cæcum and colon, the symptoms are so strikingly different from carcinoma that the difference has been emphasized by all observers. This is due especially to the absence of obstruction in cases of sarcoma, an observation that is also true of sarcomata of the small bowel.

Dilatation of the affected region, either as a fusiform or sacculated dilatation, is the rule, although in some cases the bowel is converted by infiltration into a thick-walled tube. This dilatation has been explained by the early infiltration and paralysis of the muscular fibres. In only one of the 22 cases which they studied was complete obstruction present. In this case the tumor was of the spindle-cell type and situated in the descending colon, causing almost complete stenosis with impaction of the opening by a small fecal mass. In one other case of a round-cell sarcoma of the sigmoid flexure incomplete obstruction was present.

The lymph follicles in the mucosa or submucosa seemed to be the usual starting point in these cases, and from this region the tumor involved the other coats; the muscular offering the greatest, and the subserous coat, the least resistance. The serosa itself

was rarely perforated. Dr. Speese mentioned the possibility of sarcoma developing in the subserous coat.

Their cases were almost equally divided as to sex. They ranged in age from 2 to 60. The first decade contained the greatest number, and the fourth decade the next greatest. There were only three cases over forty years of age. The duration in cases not operated upon varied widely; probably four to six months was the average after the tumor was detected. The mortality in cases operated upon has shown a great improvement since they collected their cases. At that time the mortality was 50 per cent. Of the cases recovering, one died of a quick recurrence. The other four were living at the time they were reported.

With our present familiarity with operative technic and the early performance of operation in abdominal tumors the mortality is no doubt at the present time very much below this figure.

DR. JOHN H. GIBBON said that he had never seen a sarcoma of the small intestine but was interested especially in the question of resection in this condition. As surgeons realize the importance of the small intestine as a digestive organ their respect for the stomach decreases. One may get along very well without a stomach, but it is difficult without the first portion of the small intestine. One may take out only a small amount, two or three feet, of small intestine, and the patient will suffer greatly from inability to digest his food. He had seen this even where he had only taken out 18 inches two or three feet away from the beginning of the jejunum. The diarrhœa will keep up for months and the patient will go down to a shadow. Most of his cases had been in tuberculous individuals. Two years ago in a case with an enormous lipoma producing intestinal obstruction he did a resection in order to remove the growth which at first he thought to be an inoperable retroperitoneal sarcoma; in this case it was necessary to resect a large amount of small intestine in order to remove the tumor, and he found himself within three inches of the jejunum, with just enough bowel to make an anastomosis, and he had removed $9\frac{1}{2}$ feet of small intestine. This man for a short time had little disturbance, but for 18 months he was very sick; had diarrhœa, could not digest his food, everything gave him pain, he passed his food undigested, lost weight, and only in the last six months has the remaining portion of his intestine taken on the function of the resected portion, so that he is now getting better.

DEPOSIT OF METALLIC SILVER IN BODY TISSUES.

DR. ADDINELL HEWSON gave a preliminary notice of the fact that he had been able to deposit metallic silver in the glomerule of the kidney in cadavers. The process by which this was attained was by injecting into the aorta a 2 per cent. solution of nitrate of silver and a 5 per cent. solution of formaldehyde in distilled water. Immediately following this mixture, a 2 per cent. solution of ammonia in distilled water was injected and the deposit of silver could be seen increasing in the papillary layer of the skin, giving the subject a mottled appearance.

Dr. Hewson reported that at a subsequent meeting he would show specimens of this work with the various tissues, but desired to give formal notice of the fact that he had succeeded in making a deposit of metallic silver in the tissues.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

*Stated Meeting, held at the New York Academy of Medicine,
October 22, 1913.*

The President, DR. FREDERIC KAMMERER, in the Chair.

TUMOR OF THE CAROTID.

DR. FRANK S. MATHEWS, presented a man, twenty-seven years old, upon whom he had operated two and a half years ago for a tumor of the carotid body. The man stated he had noticed all his life that there was a greater fulness in the left side of the neck than the right.

Dr. Mathews said he made an attempt to remove the carotid tumor, but its extirpation proved impossible because of its ill-defined character, the great vascularity of the surrounding tissues, and the infiltration of important structures. The man had remained in fairly good health and had continued at his usual occupation. The growth was still small, although perhaps fifty per cent. larger than at the time when the operation was attempted, two and a half years ago. At that time a section was removed for examination; it was pronounced an "alveolar sarcoma," the pathological picture closely resembling that described in other cases of this rare form of tumor.

This patient now presented all the important characteristics of this type of growth, which were largely explained by its vascularity and its origin at the bifurcation of the carotid artery, inside of the sheath. The involvement of the pneumogastric, hypoglossal and sympathetic nerves was shown by the paralysis of the left vocal cord, hemiatrophy and paralysis of the tongue, and contraction of the left pupil. The growth extended upward from the carotid bifurcation to the base of the skull and the anterior parotid

region. The left side of the pharynx was pushed inward, the tonsil was near the middle line, and its pillars were œdematous. There was a bruit, synchronous with the heart beat, over the tumor and upon the cheek, together with a rather definite expansile pulsation.

At the time of operation the internal jugular in the lower part of the neck was empty, while the veins in the upper neck were much engorged.

The speaker said that the high mortality following the operation, the fact that at times it had to be abandoned, the dangers of carotid ligation and the rather characteristic symptom-complex emphasized the importance of diagnosis while the tumor was quite small, so that the operation could be done at an early stage, if at all. The exceeding difficulty of these operations was generally admitted. Though the tumor in this case was still small when the patient first came under observation, its removal was abandoned when it was found that the carotid, the internal jugular, important nerves, and the pharyngeal wall, would have to be removed. It would have been difficult to ligate the internal carotid above the tumor, which seemed to extend up to the base of the skull.

HYGROMA OF THE NECK.

DR. MATHEWS presented a child, three and a half years old, that came under his observation with a tumor on the right side of the neck. The growth was soft and fluctuant, like an abscess. On operation, it was found that it extended down underneath the clavicle, and was made up of a number of compartments, like those in the cases described in the paper of Dr. Charles N. Dowd, which was published in the *ANNALS OF SURGERY*, issue of July, 1913.

HYGROMA OF AXILLA AND NECK.

DR. WILLIAM A. DOWNES presented a girl, nineteen years old, who was admitted to St. Luke's Hospital on September 8, 1913, with the history that ten months ago she first noticed a swelling in the right axilla, which gradually increased in size. It was not painful nor tender, but in the last few weeks it became so large that it interfered with the free use of the arm, and in this way gave rise to pain.

Examination showed that the entire right axilla was occupied by a cystic tumor extending upward behind the clavicle and displacing the left breast downward and forward. The overlying skin was not adherent and the growth was movable over the deeper tissues.

The growth was exposed through a transverse incision, to which a vertical incision was added, extending down from the centre. It was necessary to divide both the pectoral muscles in order to enucleate the growth, which was removed intact with the exception of one small loculus, which ruptured. The divided muscles were then sutured, and the wound was closed. The patient was discharged on September 20. The growth proved to be a hygroma.

SPLENECTOMY FOR SPONTANEOUS RUPTURE OF THE SPLEEN IN TYPHOID FEVER.

DR. WILLIAM A. DOWNES presented a man, thirty-six years old, a physician, who was admitted to the New York Hospital, in the service of Dr. Lewis A. Conner, on February 20, 1913, with the diagnosis of probable typhoid fever. Up to the onset of his symptoms, seven days before, he had never been seriously ill in his life. He had never had malarial fever nor any other disease likely to lead to enlargement of the spleen.

Upon examination, the abdomen was full and soft. No rose spots. Liver dulness extended in mamillary line from the sixth rib to the free border. The edge of the liver could not be made out. Both kidneys were indistinctly felt; not tender. The area of splenic dulness was considerably increased, extending from the eighth to the eleventh rib, and anteriorly 3 cm. beyond the costal margin. The edge of the spleen was distinctly felt, even with quiet respiration, and on deep inspiration it extended fully 4 cm. below the costal margin. It was unusually broad; its edge was blunt and rounded, and its consistence noticeably firm and tense. Palpation of the spleen caused distinct tenderness.

The patient's temperature, on admission, was 100.4° ; respirations, 22; pulse, 88. On February 21 he passed a restless night, with much headache and general discomfort. Early that evening he complained of a sudden, sharp, stabbing pain in the left hypochondrium, soon followed by a severe, aching pain in the

left shoulder, radiating somewhat down the left arm. Soon after the onset of the pain he vomited a small quantity of clear fluid, and broke into a profuse perspiration. The pain was so severe as to require an injection of morphine. The respirations were rapid and shallow; there was marked tenderness to pressure just below the costal margin, where the spleen could be distinctly felt, and slight rigidity of the upper part of the left rectus muscle. At times, the pain was felt somewhat in the right hypochondrium.

On February 22 the severe pain in the left side and left shoulder continued throughout the night, in spite of a second injection of morphine. When seen in the morning, the patient looked much more seriously ill. His eyes were sunken, his features drawn and anxious, his respirations shallow and hurried. There was distinct tenderness in the left hypochondrium, and slight muscular rigidity, so that the spleen could not be distinctly felt. The area of splenic dulness, however, seemed larger than on admission. On February 23 the patient passed another restless, uncomfortable night, complaining chiefly of headache and nausea. At times he was slightly delirious. During the day his general condition and appearance improved much, and he was able to take and retain a fair amount of liquid food. The bowels were moved satisfactorily by enema. The pain in the left side had ceased to be troublesome, but there was still slight tenderness in the left upper quadrant. The physical signs in the chest were unchanged, and it was impossible to determine the nature of the violent attack he had had two days before. The occurrence of a pulmonary infarct was suspected, but neither the symptoms nor the physical signs were sufficiently characteristic to justify the diagnosis. The extremities showed no indications of a thrombophlebitis.

On February 24 the patient's general condition was still further improved. He passed a comfortable day and night and seemed to be settling down to a fairly normal typhoid course. Although the Widal test was still negative, blood cultures taken on February 21 showed a Gram-negative bacillus which resembled bacillus typhosus, and which two days later was identified positively as such.

On the morning of February 25, the patient awoke, refreshed after a comfortable night. At 8.30 A.M. he had an attack of coughing, and immediately afterward complained of the same

very severe pain in the left hypochondrium and left shoulder. The pain persisted during the morning, and was accompanied by profuse sweating and by the same startling change in the patient's appearance and general condition. His pulse was rapid, small and soft; his respirations hurried, his skin covered with cold sweat and he complained of weakness and nausea. It was evident that something serious had happened, and that his condition was growing progressively and rapidly worse. Examination of the chest showed no change from that of the preceding days. There was dulness on percussion over the greater part of the left side of the abdomen and in the left flank, and some rigidity and tenderness in the left upper quadrant: the rest of the abdomen was soft and flat, and while having a somewhat boggy feel, was not tender. Dr. Downes and Dr. S. W. Lambert were called in consultation, and all agreed that the symptoms indicated a rupture of the spleen. The diagnosis was arrived at by considering the location of the pain, the tenderness and the muscular rigidity; by the absence of signs pointing toward other likely complications, such as intestinal perforation and pulmonary infarct, and, finally, by the fact that the spleen had been recognized as being unusually large and tense for the early days of typhoid fever. With the hope of obtaining some confirmatory evidence of severe hemorrhage, a blood examination was made about three and a half hours after the onset of the pain, and while the symptoms pointed strongly to an alarming loss of blood, the examination gave the following results: red cells 5,280,000; hæmaglobin (Sähli) 85 per cent.; leucocytes 35,000.

In spite of these apparently inconsistent blood findings, an immediate exploratory operation was decided upon, and at 1.45 P.M., about five hours after the onset of the symptoms, the patient was taken to the operating room. The temperature, which at 8 A.M. had been 102.8°, had fallen to 100°; the respirations were 32; the pulse rate 118. Dr. Downes, under local anæsthesia, opened the abdomen by a vertical incision through the middle of the left rectus muscle. Upon incising the peritoneum, the abdomen was found to contain a large amount of blood. The patient was thereupon given nitrous oxide gas and ether by Dr. Thomas L. Bennett, and the incision was rapidly enlarged to the extent of eight inches. A tremendous quantity of fresh and

clotted blood, estimated at from a quart and a half to two quarts, escaped from the abdomen. The left hand was immediately passed to the pedicle of the spleen, which was grasped between the index and middle fingers, and with the right hand the spleen was delivered through the wound. At this point the pedicle was caught with a long, straight rubber-covered clamp, placed close to the spleen. The vessels were then ligated about two inches proximal to the clamp with No. 2 chromicized catgut. The larger blood clots were rapidly removed and the abdomen was closed by layer sutures, without drainage. Time of operation, twenty minutes.

When the hand was first placed behind the spleen lying in its bed, a rent in the capsule, fully three inches in length and running along the posterior border, was encountered. During the manipulation this rent was so enlarged that by the time the organ was delivered from the wound the capsule had been stripped from almost half its surface.

In spite of his critical condition on the operating table, which necessitated an intravenous infusion of salt solution, the patient improved steadily during the succeeding twelve hours. His loss of fluid was replaced by saline solution given by hypodermoclysis and by the Murphy "drip." At 10 P.M. that night the hæmaglobin percentage had fallen to 62, and his leucocytes numbered 68,000. On the following morning (February 26) the pulse had fallen to below 100, and his general condition was very satisfactory. The patient's convalescence was delayed by signs of a pulmonary infarction and a thrombophlebitis of the right arm and calf, but these symptoms gradually subsided, and he was able to leave the hospital on March 31, 1913. A month later he had regained his lost weight and seemed in almost his usual health. At the present time, his health was excellent.

SPLENECTOMY FOR TRAUMATIC RUPTURE OF SPLEEN.

DR. JAMES M. HITZROT presented a boy of fourteen who was admitted to the New York Hospital with the history of having fallen from a truck, striking the edge of the curb on his left side. He felt weak and sick after the fall and complained of severe pain in the left lumbar region. The pain was aggravated on inspiration. He also suffered from thirst.

On admission, the boy was in a state of mild shock! His

temperature was 98.6°; pulse 120, regular and of small volume; respirations 48 per minute and gasping in character. The abdomen, which was slightly scaphoid, showed a small contusion over the left tenth rib in the posterior axillary line. The abdomen did not move on respiration, and there was tenderness, especially along the left gutter, with rigidity, but no spasm. In the left loin there was tenderness on deep pressure, with dullness. A blood count gave 18,000 white cells, with 85 per cent. of hæmaglobin.

The case was regarded as one of rupture of the spleen, and the patient was operated on one hour and fifteen minutes after the injury. A six-inch incision was made through the outer border of the left rectus, revealing a bellyful of blood and a lacerated spleen, with its pedicle torn through at the hilum. A clamp was applied and the spleen removed. The tail of the pancreas was elevated, and a spurting artery running parallel to it was clamped. A clamp was also applied to a mass of infiltrated tissue, the lienorenal ligament, just above the artery. There was some oozing in the phrenosplenic ligament which was controlled by gauze. A small accessory spleen was made out, about 1.5. x 1 cm. in size, just mesial to the clamp on the splenic artery. The free blood in the peritoneal cavity was evacuated by suction. The boy was given an intravenous saline infusion, and the wound was closed by tier suture with a small cigarette drain to the site of the oozing in the phrenosplenic ligament.

The patient made an uninterrupted recovery; the drain was removed on the fourth day, and the wound healed *per primam*.

An examination of the patient's blood, made on the day of the operation, showed 4,288,000 red cells; 18,450 leucocytes, with 85 per cent. polynuclears and 15 per cent. mononuclears; hæmaglobin 55 per cent. Two days later the leucocytes had risen to 34,500, with 91 per cent. of polynuclears; the hæmaglobin had fallen to 47 per cent. and the red cells to 3,756,000. There was a gradual decrease in the leucocytosis, with a slow rise in the hæmaglobin, and on September 29, eighteen days after the operation, the red blood cells numbered 3,380,000; the white cells, 17,200, with 75 per cent. of polynuclears and 61 per cent. of hæmaglobin. The latest blood examination, made on October 22, 1913, showed 4,432,000 red cells; 14,400 white cells, with a differential picture of 58 per cent. polymorphonuclears, 33 per cent. small mononuclears, 3 per cent. large mononuclears, 3 per

cent. eosinophiles, 2 per cent. cosmophiles, and 1 per cent. transitionals. The hæmaglobin was 76 per cent.

DR. HITZROT reported a second case of traumatic rupture of the spleen in a boy, seven years old, who was admitted to the House of Relief, in the service of Dr. Alexander B. Johnson, on August 26, 1913. The history obtained was that he was knocked down by a truck, and it was thought that one of the wheels passed over his abdomen. When he was brought to the hospital, at 12.50 P.M., he was in a condition of marked shock. His temperature was 97°; pulse, 160; respirations, 32. There were no external signs of violence. The abdomen was somewhat distended and there was marked general tenderness and rigidity with dulness in both flanks—slightly movable. The blood-pressure was 70 mm.

At 4 P.M., four hours after the injury, the abdomen was opened, and a ruptured spleen completely torn loose from the pedicle and lying loose in the splenic fossa was found and removed. During the operation, an infusion of warm saline was given. Salt solution was also introduced by the Murphy "drip," and the patient was surrounded with hot water bottles. About an hour after the operation, the patient's pulse, which had improved considerably under stimulation, again became weak, and he went into a state of profound shock, which ended fatally at 8.20 P.M.

Both these cases are reported to emphasize the greater seriousness of that type of splenic rupture in which the laceration involves the hilum, a fact pointed out by Berger (*Archiv. f. klin. Chir.*, Bd. 68, 1902), who states that this injury is rare and also that the recovery from it is less frequent than in the other type.

DR. ELLSWORTH ELIOT said that he had never seen a case of spontaneous rupture of the spleen. He had, however, seen a considerable number of cases of traumatic rupture of the spleen, and in speaking of the etiology of this form of injury, there was one predisposing factor which he had met with in two of his cases, namely, a history of malaria, with the formation of adhesions which had bound the spleen to the ribs and rendered it more susceptible to the effects of trauma, through limitations of its movement.

In one of his cases, Dr. Eliot said, the patient was a young girl, who, while riding on a pony, slipped or slid to the grass, giving no indication of direct trauma. Her symptoms led to the diagnosis of rupture of the spleen, and upon laparotomy, a tear

of the spleen on its diaphragmatic surface was discovered with considerable blood in the left flank. As hemorrhage had ceased, a tampon was inserted, the spleen remaining *in situ*. The patient made a good recovery. Here the rupture was evidently the result of indirect violence.

Dr. Eliot said that in the recognition of this condition, particularly before hemorrhage has been excessive, he had found dulness in the left flank elicited by auscultatory percussion of great assistance. As to the end results of splenectomy, he had investigated, in 1906, the literature to ascertain if there was any actual lowering of the resistance produced by the loss of the spleen, and had found only a single instance where the short, rapid, and uneven course of a subsequent lobar pneumonia was ascribed to such particular factor. In one of his own cases the patient had a very interesting history, and ultimately died of diffuse suppuration of the liver, in connection with a cholelithiasis of long standing.

As bearing upon the blood findings after splenectomy, the speaker said that in one instance, in the course of the operation, several small accessory spleens were found in the gastrosplenic omentum. Much depended on the presence or absence of these small segments of splenic tissue, which might easily escape detection. The rapid return of some of these patients to an apparently normal condition, as well as the absence of any manifestation of impaired resistance, which are not at all uncommon, might be ascribed to the presence of these bodies.

DR. FREDERIC KAMMERER said that about eleven years ago he presented a case at a meeting of this Society very similar to that shown by Dr. Downes. In his case, the rupture of the spleen occurred during the third week of typhoid fever. It was evident that the patient was suffering from a hemorrhage, and upon opening the abdomen through a median incision, he found the peritoneal cavity filled with blood. Upon lengthening the incision and removing the blood clots, a much enlarged spleen was found, with a rent about four inches long in its capsule. In the course of the most careful manipulations, this rent suddenly increased to about eight inches, the pulp protruded from the rent and as the hemorrhage was becoming alarming, the spleen was removed. The patient died about twelve hours later. The specimen after operation showed a simple tear in the capsule, which did not

extend into the pulp of the spleen. The latter was absolutely intact, and it was evident that hemorrhage had occurred from the separation of the capsule from the pulp. This, at the time of the presentation, was considered very unusual, some authors even denying the possibility of such an occurrence.

DR. DOWNES said that Dr. Conner, after a very exhaustive search, had found a record of only twelve similar cases in the literature. In nine of these, the condition was discovered at autopsy; in the three remaining cases, including the one reported by Dr. Kammerer, the rupture of the spleen was found in the course of operation done for supposed intestinal perforation. None of these cases recovered.

DR. HITZROT said that in the case he had shown there was an accessory spleen about one and a half cm. long and one cm. wide. This was found near the pedicle.

GANGRENE OF THE CÆCUM SECONDARY TO CARCINOMA OF THE COLON.

DR. JOHN A. HARTWELL presented a salesman, thirty-four years old, who was admitted to the Presbyterian Hospital on May 1, 1913, with the following history:

He was operated on for chronic appendicitis in 1909. Normal convalescence. Since this time up to the beginning of the present trouble he has considered himself in good health, though on careful questioning he states that he has noted some increasing constipation over a recent period. His present illness dates back for one week, and began with acute abdominal pain, distributed pretty generally over the abdomen, with marked constipation, though the bowels have moved after energetic catharsis. Vomiting occurred after two or three days, and the pains got increasingly more severe and gradually became localized to the lower part of the abdomen, more particularly in the right lower quadrant. On admission he presented a typical picture of intestinal obstruction, and the diagnosis of this condition, due to adhesions from a previous operation, was made. Operation was immediately performed, an incision being made in the cæcal region. On opening the peritoneum there was an evacuation of about six quarts of intestinal contents with considerable solid fecal matter. This was mostly confined to the pelvis, but there was some evidence of it extending throughout the peritoneum. The entire anterior

wall of the cæcum had sloughed away, making an opening several inches in diameter in which the ileocæcal orifice presented. An adherent band running from toward the midline outward to the ileum seemed to have completely shut off circulation, causing the cæcal gangrene. The abdomen was thoroughly washed out with large quantities of normal salt solution, by means of a suction apparatus, and drains were inserted. He was returned to the ward in fair condition, and immediately began to have copious evacuations through the open cæcum, which had been loosely attached to the skin wound. During the 36 hours following operation he received continuous hypodermoclysis of normal salt solution of which he absorbed 7 litres. This was given following the teaching of Hartwell and Hogue whose experimental work showed that a serious factor in intestinal obstruction was the dessication of the tissues. His recovery was long and tedious, and in late July an operation was performed for the closure of the fecal fistula, it being planned to make an anastomosis between the ileum and the ascending colon, with the removal of the intervening portion of the large bowel. On opening the abdomen, however, a firm hard tumor was found in the splenic flexure of the colon, causing a complete obstruction. Grossly, this presented all the characteristics of a carcinoma. A number of lymph-nodes in the vicinity were found involved, one of which was removed for examination, and proved to be non-malignant. Lateral anastomosis was made between the ileum and the descending colon below the obstruction, the ileum having been sutured near the cæcum and the two ends closed by inversion. His condition since the operation has steadily improved. He has normal movements per rectum and there is practically no discharge from the cæcal fistula which drains the large bowel as far as the stricture at the sigmoid flexure. The question to be considered is as to the advisability of removing the growth above the anastomosis, and if this is done, what shall be done with the portion of the large bowel between this point and the cæcum?

The interesting points in the case are the fact that a patient could survive the conditions found at the original operation, and the fact that the occlusion of the bowel had gone on to such an extent without symptoms, and the marked benefit that he apparently received from the absorption of such an enormous amount of salt solution in the first hours after his operation.

DR. GEORGE WOOLSEY, who had seen Dr. Hartwell's patient during the operation, said it then looked like a very unpromising case. As to the future outlook of the case, the speaker said that in view of the fact that in malignant growths of the large intestine it was not uncommon to find enlarged lymph-nodes that did not show carcinoma, the pathological findings in this case could not be regarded as particularly helpful in determining the character of the new growth. The patient was certainly sufficiently advanced in age to allow of the diagnosis of a malignant tumor.

Dr. Woolsey said this case recalled a somewhat similar case that came under his observation some years ago. The patient was suffering from intestinal obstruction, and an opening was made in the cæcum which relieved an enormous dilatation of the cæcum and ascending colon. Subsequently, the obstruction recurred and was relieved by severing a lot of adhesions. Still later, a tumor was found in the splenic flexure which on removal proved to be malignant. That patient was only twenty-two years old.

DR. KAMMERER said that acute obstruction, without any previous symptoms, was not so very rare as cancer of the large intestine. Compensation, by hypertrophy of the intestine proximal to the seat of trouble, often delayed the development of any marked clinical symptoms until the lumen of the gut had been narrowed down to a very small passage. Then the arrest of some intestinal contents at this point might cause complete obstruction, temporary perhaps, but, at all events, the first serious symptom manifested in the case.

DR. HARTWELL, in closing, said this man had absolutely no symptoms of obstruction until the sudden onset of complete obstruction. Several weeks ago he saw a somewhat similar occurrence in a woman, who, with the exception of some cramp-like pains dating back for a number of years, had been comparatively free from symptoms until the day prior to her admission to the hospital, when she was seized with acute vomiting. An exploratory operation revealed a complete obstruction of the bowel by constriction at the splenic flexure. That patient died.

BONE TRANSPLANT SUPPLYING THE UPPER THIRD OF THE HUMERUS.

DR. GEORGE D. STEWART presented a school-boy of eleven years who was admitted to St. Vincent's Hospital on June 1, 1912,

with the history that on that day he had been knocked down by a horse-car, one of the wheels passing over his right arm and shoulder.

Examination showed a compound, comminuted fracture of the upper end of the right humerus. The axilla was opened so that the finger could be introduced through the wound, and the axillary and brachial arteries were exposed, but the patient had a good radial pulse, could move his fingers, and sensation was unimpaired. The wound, which was much soiled, was irrigated with iodine solution, and packed with gauze to check the bleeding. On the following day he was taken to the operating room, where loose fragments of bone were removed and drains inserted. The radial pulse still continued good. Following this, there was a good deal of sloughing of soft tissues, and on July 6, several fragments of necrosed bone were removed. After a time, the sloughing ceased, and on October 1 the patient was discharged, the wound having completely healed. At this time there was a false point of motion above the middle arm and it was evident that there was an absence of bone in this region: indeed, the tissues here were so contracted that little remained but the artery, nerves and some scarred integument.

In November, 1912, he returned to the hospital, and on the 13th of that month a transplant was taken from his tibia. This section of bone, which was about three inches in length and perhaps half the diameter of his fibula, was then inserted between the ends of the two fragments of the injured humerus. In doing this, it was difficult to find sufficient soft material to completely cover the transplant. The ends of the fragments were very sharp, and it was necessary to cut them off transversely so as to get a point of application for the ends of the transplant. As the arm had shortened considerably by contraction of the soft tissues since the time of the injury, the transplant had to be introduced under strong longitudinal traction, and difficulty was experienced in lengthening the arm because of this contraction. During the necessary dissection, the musculospiral nerve, which was much distorted, was accidentally divided and had to be sutured.

The wound healed by primary union excepting at one point, where there was a slight separation of the cut surfaces, which did not, however, extend to the depth of the transplant. Within a

FIG. 1.



Limb before transplantation.

FIG. 2.



Limb after transplant.

week, the arm seemed to be rigid throughout, and as far as could be made out, there was never any atrophy of the transplanted bone. The paralysis following the operation involved all of the musculospiral distribution. Under massage, this began to improve after a few weeks, and this improvement had steadily continued.

Dr. Stewart said that periosteum was left on the transplant covering two of its four sides. No particular pains were taken to preserve it, and in many parts its edges were raised. Whether it had any influence upon the nutrition of the bone, he doubted. In another case where he utilized a rib to form a bridge in a sunken nose, he relieved the rib entirely of its periosteum, and it seemed to serve equally well. If McEwen's findings were correct, periosteum contained no osteogenetic layer, and served simply as a limiting membrane.

In connection with this case, Dr. Stewart showed a number of X-ray pictures, illustrating the conditions before and after the operation (see Figs. 1 and 2).

This case is presented not only for its interest in connection with the transplantation of bone but also as an illustration of the value of conservative surgery in compound fractures. When it first came under the care of Dr. W. C. Lusk, who was on duty, the conditions were such that amputation seemed almost inevitable, the limb being attached to the body by barely sufficient tissue to carry the vessels and nerves. The result is a very serviceable, almost normal limb.

BONE TRANSPLANT IN A CASE OF RECURRENT FRACTURE OF THE PATELLA.

DR. JOHN ROGERS presented a young woman to illustrate a case of bone grafting in recurrent fracture of the patella. The original fracture in this case occurred on November 1, 1912, and was treated by suture. The following February the patient slipped and re-fractured the patella, and at this time, in addition to the usual treatment of suture, Dr. Rogers chiselled a small bone graft from the front of the tibia, and after lifting the patella periosteum, he inserted the bony graft underneath and sutured it there. The result was excellent. The graft has not become absorbed. A radiograph taken in October, or nine months after

insertion of the graft, shows it still in place and unchanged in size. Its under surface has blended with the anterior surface of the patella, and the former line of fracture is filled with bone. This method of treatment was employed by Dr. Rogers to repair a non-union of the patella in another case, with excellent results.

THE FUNCTION OF THE PERIOSTEUM IN BONE TRANS-
PLANTS: BASED ON FOUR HUMAN TRANSPLANTA-
TIONS WITHOUT PERIOSTEUM AND TWENTY-
EIGHT ANIMAL EXPERIMENTS. ILLUSTRATED
WITH LANTERN SLIDES.

DR. CLARENCE A. MCWILLIAMS read a paper with the above title, for which see page 465.

DR. JAMES M. HITZROT said Dr. McWilliams' paper was particularly interesting to him inasmuch as his interest was directed toward the function of the component parts of the bone in the process of repair after fractures. In this repair process new bone appears from the periosteum and from the endosteum on both sides of the fractured cortex, most marked on the concave side of the fracture. The cortical bone does not participate in this process until after the new bone has undergone a fairly marked degree of consolidation and there is no evidence of bone cell proliferation from the cells of the cortex. In fact, the space between the fractured ends seems to become filled by cells arising from the endosteum and to a lesser extent from the periosteum, while the cortex is undergoing absorptions. Cotton and Loder (*Surg., Gyn. and Obstetrics*, June, 1913) consider the endosteum as the important factor in the formation of bone in the transplant. My experience with cortical bone without periosteum has been similar to that of Dr. McWilliams, that is, failure in four cases with absorption of the graft.

In one of my grafts a fracture due to a fall occurred but the outcome was not as satisfactory as that case shown by Dr. McWilliams, inasmuch as the graft became absorbed and union did not occur, although the X-ray picture had shown new bone along the surface of the graft before this accident.

DR. FISK said that at a recent meeting of the alumni of the Massachusetts General Hospital in Boston, Dr. David F. Jones had shown a case where he had resected the entire lower jaw. Afterward this patient was referred to the Harvard Dental School,

where an ingenious apparatus was devised to replace the lower jaw bone.

This consisted of a bridge which was fastened to the molar teeth on the upper jaw, at each end of the bridge there was a ball-and-socket joint. And from the lower surface of each ball there extended downward a pivot, which fitted into a socket in the ascending ramus of an artificial lower jaw bone, made of gold, on which were teeth. This gave a shapely contour to the lower portion of the face; an open and shut action of the mouth, with, also, a slight grinding or lateral motion.

THE FORMATION OF A NEW THUMB BY KLAPP'S METHOD.

DR. H. H. M. LYLE showed X-ray plates and photographs of a case where a new thumb had been formed from the metacarpus. This patient's left hand was run over by a trolley car. The thumb, index and middle fingers were evulsed at the metacarpophalangeal joints, the ring-finger at the base of the first phalanx. There was a fracture of the metacarpus of the thumb, the dorsal skin was destroyed up to the level of the wrist, the tendons of the above fingers were torn off.

Operation at St. Luke's Hospital. The stump of the hand was trimmed, the torn tendons brought down and sutured over the ends of the bones, the fracture of the first metacarpus corrected, the whole enclosed in a saturated dressing of Balsam of Peru.

The wound remaining clean, the hand was inserted under an abdominal pocket flap. The flap took nicely and provided a good covering for the dorsal aspect of the hand and wrist. A curved dorsal incision dividing the soft parts between the first and second metacarpals was made; the first metacarpus mobilized by separating the attachment of the dorsal interosseous. In this way it was possible to approximate the metacarpus of the thumb and little finger. Care was taken to avoid injuring the thenar muscles. The skin of the dorsum was carried around the metacarpus of the index finger and united to the palmar skin, the carpus of the thumb being treated in a similar way.

The most important finger in the hand is the thumb and its loss is a serious misfortune. Klapp's method, by producing a short but useful thumb, provides an amelioration of this distressing condition, and marks a distinct advance in the traumatic surgery of the hand.

*Stated Meeting, held at the New York Academy of Medicine,
January 14, 1914.*

The President, DR. FREDERIC KAMMERER, in the Chair.

SUBCLAVICULAR DISLOCATION OF THE HUMERUS.

DR. ROBERT H. M. DAWBARN presented an elderly man, who, seven months before entrance to the City Hospital, had fallen, causing a typical subclavicular dislocation of his left humerus. Repeated attempts at reduction under anæsthesia had been made before his admission. The elbow stood away from the side at an angle of about thirty degrees, and all motion of the arm was very painful.

Under major anæsthesia, one month ago, another attempt at reduction was made. This failing, the head of the humerus was excised through a vertical incision close to the anterior edge of the deltoid. It was placed thus far forward for two reasons: to save the more readily the long tendon of the biceps, and to destroy as little as possible of the value of the circumflex nerve, which inevitably had to be divided.

No attempt was made to do what seemed simple, but was really quite the reverse, namely, to free the bone from its false position, clear out all tissue from the glenoid cavity and replace the humerus. This, Dr. Dawbarn said, he would never personally attempt, at least in a case of long standing, such as this. Twice he had had the opportunity to assist excellent surgeons and dissectors at such an attempt, the first time under the late Dr. Charles McBurney, who, notwithstanding his deftness with the knife, cut the musculospiral nerve by accident. The second time was with Dr. John A. Wyeth, and after more than two hours' work it was accomplished, but the patient died from shock.

In the present case, the speaker said, he chiselled through just below the head, which was then removed in several large bites by the rongeur forceps. The work took but about twenty minutes altogether. As was now evident, after the healing, which was *per primam*, the man had a comfortable, freely movable false joint, with so little shortening of the limb as hardly to be notice-

able. He was receiving daily treatment with electricity and massage, and strychnine by needle, chiefly into the deltoid muscle.

BONY ANKYLOSIS OF THE ELBOW: FRACTURE OF THE
LOWER EXTREMITY OF THE RADIUS.

DR. DAWBARN presented a woman of forty, who six months before her admission to the hospital had fallen, badly breaking her right elbow and producing a fracture of the lower extremity of the radius on the same side. She had sustained a similar injury of the left wrist some years earlier. Both fractures were typical of improper treatment, the wrists being badly deformed, and her right elbow was entirely ankylosed. She permitted operation, one month ago, upon the right limb, because, as she said, she had to work, but no persuasion could induce her to allow her left wrist to be corrected at the same time.

Both operations were a success. The elbow incision was a six-inch vertical Langenbeck one, the olecranon being its midpoint. The triceps insertion was split and removed by "egg-shell" work with chisel and mallet, leaving its continuation into the deep fascia of the forearm intact. The entire trochlear surface of the humerus had to be chiselled away, and then one of the half insertions of the triceps was freed below and so fastened as to prevent bony ankylosis. Passive and active motion were both refrained from until three weeks had gone by—the usual period of exudate of callus: this to lessen the exudate of provisional callus and hence new bone in the joint, in excess.

At the wrist, the operation performed was that which was described in Binnie's Operative Surgery, and elsewhere, and credited to Dr. Dawbarn. In the latter's opinion, it was frequently needed. He had done it now over twenty times with success, and had read a paper upon it and showed patients a good many years ago at a meeting of the Fifth District Medical Society of New York State in Newburgh.

The technic of the operation for the correction of the wrist deformity was as follows: A vertical incision was made at the seat of the radial fracture. The soft tissues were dissected off the bone, back and front, gauze being packed in as a protection during the next step, namely chiselling. By this means, transversely, the bone was divided entirely, and then, by leverage, the lower frag-

ment of an inch or so was pried distally until its styloid process was, as was normally the case, about two-thirds of an inch nearer the digits than that of the ulna. Next, the matted and often useless tendons, from old tenosynovitis—those normally grooving the back of the radius here—were dissected free from other tissues to play hereafter in loose connective tissue beneath the skin. As much of each sheath as was practicable was removed. To the surgeon, the sheath was simply a nuisance, inviting adhesions again if left.

Next, at about the middle of the shaft of the ulna, a piece of this bone of about one-half inch in length was removed by use of the Gigli saw twice. This had a two-fold purpose: (a) it enabled the gap thus created to close by subsidence of the subluxated lower end of this bone, a deformity always very noticeable. Such subsidence took place spontaneously, thus encouraged, in the course of a few days. (b) The piece of the ulnar shaft thus removed was now comminuted by chisel into a number of small bits, which were tucked into the chisel-gap in the radius, thereby filling it by a bone-plastic job, preventing the chisel-gap closing together, with return of the deformity. Next, the skin was closed as usual.

In the present case the result was seen to be perfect, and, in striking contrast with the deformity of the left wrist, still uncorrected.

DR. L. W. HOTCHKISS asked if it was necessary, for the correction of this type of deformity, to divide the ulna. Did not this step and the introduction of the fragments of bone into the gap of the radius needlessly complicate the operation? Personally, he had corrected many of these deformities by simply chiselling through the radius, and he did not think that a more extensive operation was usually indicated.

DR. DAWBARN replied it was because of the unsatisfactory results of the old method—for simply chiselling the radius was old indeed—that he came to try the present plan. He objected to its being considered as adding a complication and taking time needlessly. Certainly it was worth while to overcome the ulnar deformity almost or quite as much so as the radial, and this could only be done by removing a piece of it, and once removed, it did not add over a minute or so to the work to comminute the ulnar

piece and make use of it in the radial gap, thus assuring maintenance of the styloid process at the level desired.

DR. JOHN F. ERDMANN asked why Dr. Dawbarn comminuted the ulnar fragment. Why not place it in the radial gap just as it came from the ulna?

DR. DAWBARN said that in the first place, its shape would preclude its fitting the gap in the radius, if this were tried. Again, the more finely a bone was subdivided, the greater became the prospects for success in re-planting it, for its blood-vessels no longer carrying nourishment to its interior, it depended for life upon the vitalized plasma bathing it; and the more the comminution, the shorter the distance that nutriment had to be carried to the interior of the bone by capillarity—the only remaining possible way. Sir William MacCormack taught us that in many cases trephine discs, if replaced and possessing a fair amount of diploë, would live, but experience proved that if the trephine disc be first well chiselled or bitten into small pieces, and then replaced upon the dura mater, its chances of surviving were greatly increased.

MODIFICATION OF SYME'S AMPUTATION.

DR. DAWBARN presented an Italian lad of nine years who three months ago was run over by a truck, partly crushing his left foot, in consequence of which the entire foot died, including the heel. This made a typical Syme's amputation impossible; and indeed, the present case differed from the regular Syme's, although performed at the usual level, in three ways, and Dr. Dawbarn said he considered the case to represent a real advance in technic and in end-bearing comfort. Point number one was that the entire flap had to be made from the comparatively thin skin upon the anterior surface. Point number two was the fact that the main nerves, all capable of pain, were carefully shortened, so as no longer to be walked upon and nipped between the stump end and the artificial limb, a thing often occurring otherwise. The posterior tibial nerve and its plantar continuation were dissected from the accompanying vessels and divided at a point some two to three inches above the stump-end. The same was done with the external saphenous nerve, and (in this case) with the internal saphenous nerve. Point number three had to do with the fact that a typical

Syme's amputation was a curious mixture of a good and bad principle, if we accepted, as he thought all surgeons now did, Bier's postulate that no matter how much muscle, fat and fascia covered and padded a stump-end, it could never be a thoroughly first-class "end-bearing stump" unless its bony end was covered by (a) either normal articular cartilage, or (b) periosteum. As a typical instance of the former we had a Stephen Smith amputation at the knee, and as an equally good example of the latter we had a Gritti amputation, osteoplastic, at or rather a little above that level, the patient walking upon the periosteum covering the anterior surface of his patella.

Now, as to the Syme's technic, the central two-fourths or thereabouts would be the cartilage of the lower end of the tibia, and consequently, method *a* of Bier. But on either side was a sawn malleolar surface, making the remaining two-fourths a flat violation of Bier's *b* method.

In the present case, and in a considerable number of previous cases Dr. Dawbarn cited, Bier's method *b* was adhered to in principle by a simple means, namely, gnawing out by rongeur forceps the cancellous interior of each malleolus, starting from the median line of the leg and working out or in, according to the malleolus under treatment, until in a very few minutes nothing but an egg-shell-like lining of the periosteum remained. The periosteum, under the application of the usual dressings, collapsed into a firm support upon either side at the same level with the central or cartilaginous two-fourths.

Although the healing was but recent in this case, about a month since the operation, the stump face was free from all tenderness; it was firm, and jarring from below, as was demonstrated, did not cause the patient any discomfort.

In conclusion, Dr. Dawbarn expressed surprise at the ignoring of the great importance of shortening all pain-bearing nerves in major amputations, so noticeable in the reports of all surgeons. Probably no improvement in amputation technic could be more important than this. For example, if he had occasion to amputate through the leg, he shortened all the five pain-bearing nerves, and this great benefit added but a few minutes to the length of the operation.

RESECTION OF THE HIP FOR TUBERCULOSIS.

DR. WALTON MARTIN presented a boy, twenty-one years old, who was admitted to the Roosevelt Hospital on February 5, 1909, complaining of pain and disability in the right hip. He stated that two years before that time he had first noticed pain in the right hip, and had commenced to limp. The pain gradually increased in severity so that it kept him awake at night. About a year later he was obliged to resort to crutches, and a plaster case was applied to the body and thigh, which he had worn constantly since. Otherwise he had always been well.

Physical examination at the time of the boy's admission showed marked limitation of motion, due to muscular spasm, with tenderness over the hip-joint and atrophy of the neighboring muscles. The circumference of the right thigh, four inches above the patella, was twelve inches; that of the left thigh at the same point was fourteen and a quarter inches.

On February 8, 1909, under ether anæsthesia, the hip-joint was resected. The angular incision advocated by Kocher, passing upward and backward in the direction of the fibres of the gluteus maximus and downward along the trochanter major, was made through the skin, and the fibres of the gluteus maximus and its broad fascia of insertion were divided and retracted downward. The inferior border of the gluteus medius was exposed, and the tendon of the pyriformis identified. The tendons of these muscles were separated from their insertion into the trochanter, and retracted upward. The obturator internus and the gemelli and obturator externus were divided close to their insertion. The joint was opened, the ligamentum teres divided and the head disarticulated. A Gigli saw was passed about the neck, and the head and neck removed. The thickened synovia was dissected out, and the acetabulum carefully curetted. Iodoform powder was dusted over the surface of the acetabulum and the adjacent denuded areas, the divided muscles were approximated with catgut and a gauze drain inserted to the bottom of the acetabulum. The skin was closed by silkworm gut sutures and a plaster-of-Paris spica bandage applied. No attempt was made to fix the end of the femur in the acetabulum.

Pathological findings: The specimen consisted of the head and neck of the femur and the synovial membrane. The articular cartilage of the head was badly eroded and detached. Micro-

scopical examination showed synovial tuberculosis and tuberculous erosion of the bone near the surface. The articular cartilage appeared as small fragments imbedded in fibrous tissue.

Two days after the operation the patient showed marked symptoms of iodoform poisoning. At times he was delirious, alternating with stupor. The pulse ranged between 130 and 160; the temperature from 101° to 103°. The urine showed a marked iodine reaction. These symptoms gradually subsided, the wound healed satisfactorily and the drainage tract closed. His weight at this time was 112 pounds.

After several months the patient noticed pain and swelling in the right wrist, and examination showed a localized, fluctuating swelling over the ulnar portion of the right carpal joint. This was treated for several months by the Bier hyperæmic method, and he was then instructed how to continue the treatment himself.

On September 10, 1910, about nine months after the resection of the hip, he had a pulmonary hemorrhage, and examination showed considerable involvement of both apices. He was sent to Dr. Trudeau's sanitarium in the Adirondacks, where he remained until last autumn, when his condition was so much improved that he was permitted to return to New York. He now weighed 143 pounds; he walked easily, without pain and without the aid of a stick. His wrist showed no signs of disease.

This case, Dr. Martin said, seemed to him to be of special interest for several reasons: 1. Recovery after a considerable tubercular infection, with multiple foci in the lungs, wrist and hip. 2. The fact that the patient developed iodoform poisoning, although the amount used was not excessive—less than a drachm. 3. The very excellent movable joint which had been developed, and the appearance of the X-ray showing the margin of the neck resting against the acetabulum, suggesting the formation of a new neck.

DR. DAWBARN said that iodoform poisoning might probably be held identical in symptoms with poisoning by iodine itself, since iodoform was nearly 97 per cent. iodine. As to the latter, now so freely used by surgeons in the form of the official tincture upon wound surfaces, it would seem that this could not be free from risk as one factor in the rapid, feeble pulse of shock, especially if some idiosyncrasy should exist. The speaker said he could not forget a case where Dr. Wyeth, many years ago, had

been frank enough to report having caused the death of a patient from acute iodism. It was in the days when the usual treatment for hydrocele, after tapping and emptying, was to inject and leave in the tunica vaginalis sac tincture of iodine. This Dr. Wyeth did, not using at all an unusual amount. But if this case thus died, was it not advisable to select, especially where there seemed any risk of shock, as in long operations, weak hearts or little children, a means of flushing out the wound for antisepsis more free from risk? The speaker said he thought so, and had for some time past not used the tincture of iodine in these instances, but instead, Burrow's solution of aluminum acetate.

THYMECTOMY FOR TRACHEAL OBSTRUCTION.

DR. WILLIAM A. DOWNES presented an infant, four months old, with the following history: Five weeks after birth, which had occurred at full term and after a normal delivery, the parents noticed that the child coughed occasionally and had some difficulty in breathing. The condition was at first regarded as a cold, and the attending physician made a diagnosis of bronchitis. There was no fever. The dyspnoea was more or less continuous, with occasional exacerbations, especially at night. The breathing was noisy, and, as the mother described it, "whistling" in character. The dyspnoea gradually became more marked, and the child was admitted to the Jewish Hospital in Brooklyn, where he had many attacks of stertorous and whistling respiration but was never cyanosed. The child's digestion was good, and it had gradually been gaining in weight, although the mother stated that during the early part of the illness there had been occasional attacks of vomiting after nursing. The family history was unimportant.

When the child was brought to the Babies' Hospital, on November 15, 1913, it was nine weeks old, and the history dated back about one month. At this time there was continuous dyspnoea, with inspiratory stridor, expiration being free. In crying, the voice was clear, and there was no real hoarseness, and when the child was quiet there was a stridulous whistling sound on inspiration. He had a distinct funnel-shaped chest, and upon inspiration there was a marked depression at the suprasternal notch, and the lower part of the sternum. Percussion revealed dulness over the upper part of the sternum, extending on either side over an area 7 cm. wide, and slightly farther to the right side than

to the left. This dulness extended as low as the fourth rib on the right side and on the left side merged with the cardiac dulness. Otherwise, the physical examination was negative.

During the child's first week in the Babies' Hospital there were many attacks of partial suffocation, and one of these nearly proved fatal. There was, however, no cyanosis. A few whiffs of ethyl chloride appeared to afford considerable relief, and the inhalation of steam seemed to be the most satisfactory treatment.

Operation, November 21: Ether anæsthesia. A two-and-a-half-inch vertical incision was made in the midline of the neck, extending well down over the sternum. The inner border of the sternomastoids was exposed, and the fascia covering the deeper muscles was incised in the middle line. The sternothyroid muscles were then separated and retracted, and in the lower angle of the wound the upper pole of the thymus could readily be seen rising and falling with each respiration. The gland was covered by its thin, transparent capsule, which was caught between tissue forceps and incised. The upper extremity of the right lobe of the thymus was then grasped with forceps, and by gentle traction and wiping the capsule with gauze, this half was removed completely. No vessels were ligated. The left lobe did not come out with the right, as is frequently the case, so a similar procedure was adopted for its removal, with the result, however, that the lobe broke in two, the lower portion, less than one-half, retracting well under the sternum. At this time the trachea came well into view, as did also the left innominate vein, and as there appeared to be no pressure upon the trachea, no further effort was made to remove the remaining portion of the gland. The wound was closed with interrupted layer sutures.

Following the operation, there was little change noted in the respiration for three days, with the exception of the fact that there were no further severe paroxysmal attacks, with suffocation, such as were present prior to the operation. After the third day, however, the breathing gradually improved, and when the child was quiet, breathing was practically noiseless. A slight attack of bronchopneumonia occurred during the child's convalescence. On the fifth day, there was a rise of temperature and a discharge was noticed from the wound. From that time until the wound closed the child was kept in the prone position with the head low, in this way hoping to avoid extension of the infection to the mediastinum. That this proved successful was

shown by the fact that the temperature soon fell to normal, and there was no further trouble. The leucocytosis reached 36,000 at the height of the infection, gradually falling to 25,000 and it has since remained about 20,000. This was perhaps accounted for by a slight purulent discharge from one of the child's ears.

Weight of the thymus removed, 7.05 grammes, and the report of the pathologist was, normal thymus gland.

At the present time, eight weeks after the operation, the child seems normal in every way. He breathes freely without effort, and is gaining rapidly in weight and is apparently well.

In connection with this case, Dr. Downes called the attention of the Society to the excellent article on Surgery of the Thymus Gland, by Dr. Charles A. Parker, of Chicago, in the *American Journal of Diseases of Children*, February, 1913.

TORSION OF THE OMENTUM.

DR. ELLSWORTH ELIOT presented a man, fifty-seven years old, who was admitted to the Presbyterian Hospital on November 4, 1913, with the history that nine days before he had a sudden attack of pain in the lower right quadrant of the abdomen. The pain was sharp in character, increased by respiration and by movement of the abdomen, and alleviated by rest in bed. After persisting for several days, the pain disappeared for two days, only to recur in the same location. It was not present at the time of the patient's admission to the hospital. There had been at no time any nausea, vomiting, chills, fever nor jaundice. The bowels had been constipated for some time. The patient was said to have had a similar attack nineteen years ago, lasting six weeks. With that exception, he had always been well.

Examination of the abdomen showed a large, smooth, slightly tender mass in the lower right quadrant, and extending for several inches across the median line into the left side. It extended slightly above the level of the navel and could be distinctly felt by rectal examination. It had no respiratory movement, and was flat on percussion. It was elastic in consistency and was regarded as a large abscess connected with the appendix. The blood count, however, showed a general leucocytosis of only 8375, with 75 per cent. of polymorphonuclears. The pulse ranged between 80 and 100, and the temperature was normal.

Operation: Through an intermuscular incision on the right side the peritoneal cavity was opened, and was found to contain a

considerable amount of old, partially clotted blood. The mass was found to consist of dark-colored omentum extending across the middle line. The appendix was small, atrophic and slightly reddened, but not distinctly inflamed. It was removed in the usual way. The abdomen was then opened in the midline, below the umbilicus, and the mass of gangrenous omentum—for such it proved to be—was delivered in a twisted condition and amputated. At one point it was firmly adherent to the right, anterior abdominal wall, just to the outer side of the urinary bladder.

After the removal of the omentum, the pelvis was found to be filled with small intestine, very firmly adherent to each other and to the lateral pelvic wall. These adhesions were separated by careful dissection. The transverse colon, to which point the omentum had become gangrenous, was somewhat convoluted and distended, but not obstructed. The abdominal incisions were closed, a drain being inserted into the pelvis.

The patient was somewhat uncomfortable for several days after the operation, being troubled with distention. This yielded to colonic irrigation, and thereafter he progressed satisfactorily until the nineteenth day, when a swelling appeared in the right inguinal canal. This was opened, and several ounces of pus evacuated, from which a culture of staphylococcus was obtained. This abscess must have been the result of a continued necrosis of the stump of the omentum attached so firmly to this part of the anterior abdominal wall. The discharge from the drainage opening was largely serous, with a small admixture of pus, which disappeared about ten days after the operation.

Examination of the omental mass by Dr. Clarge showed a condition of extensive thrombotic necrosis.

DR. FRANK S. MATHEWS said he recently met with torsion of the omentum in a woman with symptoms simulating those of appendicitis. A tumor could be made out. Upon opening the abdomen he found a mass of adherent omentum which had partially rotated from right to left, but was not completely gangrenous. There were no evidences of any attachment outside of the recent adhesions. The appendix was not involved.

DR. ELIOT said that one of the unusual features of his case was the absence of constitutional symptoms in the face of such a grave condition. The patient was able to be up and about for two days after Dr. Eliot first saw him.

ABSCESS OF THE KIDNEY.

DR. ELIOT presented a man, thirty-two years old, who was admitted to the Presbyterian Hospital on October 6, 1913, with the history that since the preceding July he had suffered from a dull pain in the left lumbar region, with loss of appetite, weakness, rapid loss of flesh and constipation. In September he improved for a time, only to have a recurrence of his former symptoms, together with hæmaturia. During these attacks, the patient suffered from a high temperature and was confined to bed. There was no history of frequent micturition. The patient said he had had frequent attacks of gonorrhœa, and he believed that there had been a mass in the left lumbar region for the past three or four years.

Upon admission, the patient looked very ill, with marked anæmia and clammy perspiration. There was a smooth mass in the left lumbar region extending downward to the crest of the ileum. This was tender and did not move with respiration. The tenderness was still further increased by pressure on the lower ribs, and there was rigidity of the lower part of the left costal arch. The temperature was 104°; pulse, 130. A blood count showed a general leucocytosis of 14,000, with 81 per cent. of polymorphonuclears.

Operation: The perinephric space, exposed through a lumbar incision, was œdematous, but contained no pus. The kidney was much increased in size, of a grayish color, and was partially separated from its bed of connective tissue, to which it was moderately adherent. A cavity near its centre was first located by the needle and then opened, evacuating a considerable amount of grumous material, together with a small quantity of pus, which, upon culture, showed streptococci. This cavity was packed with gauze, the perinephric space was drained and the wound partially closed. The temperature gradually fell, reaching normal on the thirty-eighth day, and from that time on, with the exception of two sharp exacerbations of temperature, the patient's convalescence was uninterrupted. A urinary fistula persisted for about three weeks. Directly after the operation, the urine contained a large amount of pus. This gradually diminished as the wound assumed a healthier appearance, and it had practically disappeared when the patient left the hospital.

After convalescence was established, an attempt was made by

Dr. A. T. Osgood to catheterize the ureter; this failed, owing to a stricture in the membranous part of the urethra. It was not improbable, Dr. Eliot thought, that the infection of the kidney was due to an ascending pyelitis from this source.

DELAYED UNION OF THE FEMUR (SPECIFIC).

DR. ELIOT presented a man, twenty-five years old, whose family history was negative, and who gave no history of lues, either inherited or acquired. When a boy, he fractured his left tibia; healing was rapid, but was followed by a persistent, tender, localized swelling. In 1907, a portion of one rib was excised for an acute inflammation. This operation was followed by a sinus.

Present history: In February, 1911, while putting on his shoe, he felt something snap in his right thigh. He was able to walk downstairs, but while returning upstairs his leg gave way under him, the femur fracturing in its lower third. The thigh was put up in a Buck's extension for three months, and then for ten weeks in a plaster case, with absolute non-union.

The patient was admitted to the Presbyterian Hospital on October 10, 1911, where examination showed a fracture of the lower part of the shaft of the femur, with free mobility of the fragments, which were held together by soft tissues. A radiograph showed no callus nor bony deposit. The ends of the bone were in close apposition. A Noguchi Wassermann test was positive.

Up to January, 1912, the patient was given half-grain doses of mercury salicylate intramuscularly every four days, with potassium iodide, up to 180 grains, by mouth, daily. The thigh was fixed in a side splint, and was daily baked and massaged. During this period he also received fourteen injections of 10 c.c. each of his own blood at the site of the fracture.

The result of this treatment was practically negative. The thigh was no more rigid than on admission, and the radiograph showed little change in the bone, although his Wassermann was now negative. During the first six months of 1912 he received five intravenous injections of six-tenths of a gramme of salvarsan, and wore a plaster spica. He was then fitted with a walking hip splint and was discharged from the hospital with the thigh considerably firmer, but with slight change in the radiographic picture. He was given occasional doses of salvarsan until March, 1913, when, with the use of an antigen from the heart of a guinea

pig, his Wassermann showed a 3-plus reaction. In the meantime, however, the thigh became rigid, although no severe strain had been put upon it.

Beginning in September, 1913, very active antisyphilitic treatment was instituted. Mercury was given simultaneously by hypodermic and by mouth, with injections of salvarsan every four to seven days. Under this treatment, the hiatus between the fragments observed by the radiograph gradually disappeared, and was replaced by fairly dense bony tissue. The patient's Wassermann, in the meantime, remained 3 plus.

GALL-STONES IN THE YOUNG.

DR. FRANK S. MATHEWS presented a girl, sixteen years old, who came under his observation about three months ago with the history of an acute attack of gall-stone colic dating back one week. There was swelling and tenderness over the region of the gall-bladder, which upon operation was found to contain a calculus impacted in the cystic duct and pathologically showed a pure culture of typhoid bacillus. According to this girl's history, she had never had typhoid fever nor other illness.

Dr. Mathews also reported a second case of gall-stones in a patient 21 years old, and said he thought that at least one-half of the cases upon which he had been called upon to operate for gall-stones were under the age of 30. One was a woman of 24; another was a woman of 26 whose history dated back for a considerable time.

DR. DOWNES showed sixteen gall-stones which he removed last September from a girl thirteen years of age. The case was of acute onset, in fact, it had been regarded as one of acute appendicitis, and it was not until the patient was under the influence of the anæsthetic that the trouble was located in the gall-bladder.

DR. JOHN F. ERDMANN said that fully fifteen years ago he reported a case of gall-stones in the common duct of a young girl aged seventeen, whose history dated back about three years, making her but fourteen years old at the time of onset. Stones were found in the common bile duct and gall-bladder.

DR. MARTIN said he did not think that gall-stones were very uncommon in subjects under the age of 30. Last year he had operated on two such cases, one 22, the other 24 years old, with multiple stones in the gall-bladder.

FRACTURE OF THE SURGICAL NECK OF THE HUMERUS.

DR. BURTON J. LEE presented a boy, fifteen years old, who was admitted to the hospital on September 17, 1913, with the history that three days before he had fallen a distance of about three feet, striking on his right shoulder and the outer side of the arm (see Fig. 1), followed by pain and loss of function in the affected arm. He came to the dispensary, where a diagnosis of fracture of the surgical neck of the right humerus was made. At that time the shoulder was swollen, and when the shaft of the radius was rotated, the head rotated with it. External to the head was an irregular prominence which was interpreted as the lower fragment displaced outward and upward and held impacted. No crepitus was obtained. Motion was limited in all directions and there was about 2.5 cm. shortening.

On September 17, under ether anæsthesia, an attempt at reduction was made by Dr. Lee. Traction was exerted downward on the arm while the head of the humerus and the shoulder were held fixed. The arm was then abducted. Before doing this it was necessary to break up adhesions and impactions between the fragments. Only a partial reduction was accomplished. The arm was abducted to a right angle with the body, and the forearm flexed on the arm at a right angle. In this position, a plaster-of-Paris spica was applied (see Fig. 2). The X-ray showed poor position.

Five days later a second attempt at reduction was made under ether. The shoulder was fixed and traction exerted downward on the lower fragment, then the arm was abducted and rotated externally. A plaster-of-Paris spica was applied with the arm abducted to a right angle with the body, and the elbow flexed at a right angle. This attempt at reduction was also unsuccessful, and on September 26 an incision 8 cm. long was made over the outer aspect of the humerus, exposing both the upper and lower fragments. A portion of the upper fragment was found to be loose, and was removed. The long head of the biceps was found to be bound around the head of the humerus, preventing proper reduction. This was pried loose and returned to its place. The upper fragment was but slightly movable, due to adhesions, and there was considerable over-riding of the upper fragment by the lower one. To overcome this, about 2 cm. of bone was

FIG. 1.



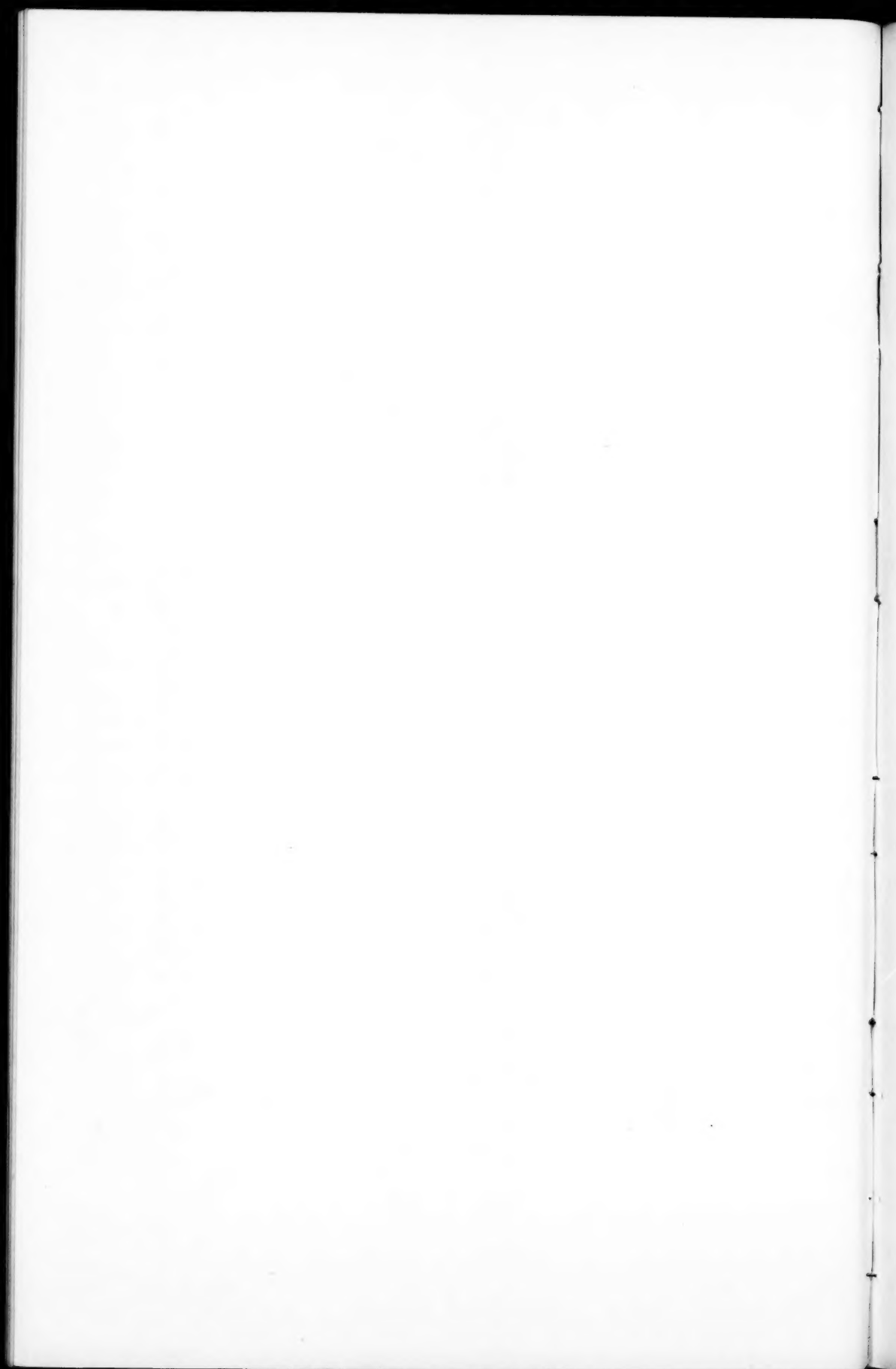
FIG. 2.



FIG. 3.



Fracture of the surgical neck of the humerus.



removed from the end of the lower fragment, which was then brought into apposition with the upper one and held by a chromic suture passed through the periosteum of the two fragments. The muscles were then sutured with interrupted plain gut, and the skin was closed with a continuous silk suture. A rubber tissue skin drain was inserted, and a dry dressing applied. The arm was held in abduction and flexed to a right angle at the elbow by moulded plaster splints. This dressing was left in place three weeks. (See X-ray Fig. 3, taken some weeks later.)

At the present time, January 14, 1914, the patient can abduct the right arm almost to a vertical line, the limitation, as compared with the normal side, being very slight. All other motions are free and apparently normal.

This case, Dr. Lee said, illustrated the difficulty of reduction of fractures of this type without an open operation, and furthermore, it was an example of a case treated successfully without a foreign body splicing the fragments.

A CONSIDERATION OF CERTAIN COEXISTING LESIONS OF THE GALL-BLADDER AND KIDNEY.

DR. ELLSWORTH ELIOT read a paper with the above title, for which see page 679.

Dr. Eliot also showed a patient, illustrating the subject of this paper.

DR. ERDMANN said he had recently operated on a man who came to him with the suspicion of having malignant disease of the œsophagus. His chief complaint was pain in the left shoulder. An X-ray was taken, which failed to show any lesion of the œsophagus, but revealed two calculi in the left kidney, and with the removal of these, the man was entirely relieved of his symptoms.

Dr. Erdmann recalled another case where he had operated for gall-bladder disease in a patient who had previously been operated by the late Dr. Edebohls for a renal calculus on the same side.

*Stated Meeting, held at the New York Academy of Medicine,
January 28, 1914.*

The President, DR. FREDERIC KAMMERER, in the Chair.

SUPPURATIVE OSTEOMYELITIS OF THE TIBIA.

DR. JAMES I. RUSSELL presented a girl, four years old, who was admitted to the Roosevelt Hospital on July 18, 1911, with a discharging wound over the left internal malleolus of the left tibia. The child's history dated back three years. When fifteen months old she developed a small abscess behind the left ear. Shortly afterward she began to complain of pain in the right leg, with swelling, redness and tenderness. An abscess developed, which was incised on two different occasions. Later, the left leg began to swell, and an abscess formed over the tibia; this ruptured spontaneously. When admitted to the hospital there was visible a small sinus just behind the internal malleolus of the left tibia which led to roughened bone, and the adjacent bone was thickened and tender.

Operation, July 22, 1911, by Dr. Russell, consisted in the removal of the whole shaft of the tibia with the exception of a small portion of each diaphyseal end, which was not involved in the suppurative process. An incision was made over the anterior surface of the tibia, splitting the periosteum, which was thickened, and which separated easily from the shaft. It was separated throughout its entire extent and the shaft removed by means of a Gigli saw. The periosteum was sutured with catgut and the skin closed, with the insertion of a small rubber tissue drain at the lower angle of the wound. A plaster-of-Paris splint was then applied.

During the course of the child's convalescence, a series of X-ray pictures were taken, which were shown by Dr. Russell with the aid of the lantern-slide to illustrate the gradual re-formation of new bone from the periosteum. The wound was dressed and the sutures removed nineteen days after the operation, and there was primary union throughout. When the patient left the hospital, on February 12, 1912, she was able to walk, and at the present time, two and a half years after the operation, the tibia was prac-

tically of normal size and the child had full use of the limb. There was no shortening.

Dr. Russell presented also a boy, who had been presented before to this society. At the time of his admission to the Roosevelt Hospital, on March 2, 1909, he was six years old. His illness then dated back one week, when, without injury or other apparent cause, he began to complain of sharp pain in the right leg, extending down from the knee to the toes. On the following day the leg became swollen, reddened and tender, especially just below the knee-joint. The pain appeared to be worse at night.

Examination, at the time of admission, showed a reddened, indurated area extending from the right knee to the ankle. The upper portion of the anterior surface of the tibia seemed to be especially involved; this area was very tender and apparently very painful upon passive flexion and extension of the knee-joint. At the point of attachment of the patellar tendon there was a slight sense of deep fluctuation, and pressure upon any part of the upper half of the tibia caused severe pain. There was no definite fluctuation in the knee-joint, and the foot was apparently normal.

The case was regarded as one of acute osteomyelitis, and, on March 2, 1909, an incision was made over the tibia and carried down to the bone, evacuating a large quantity of pus. As there was fluctuation over the periosteum, this was opened and more pus evacuated. The upper part of the shaft of the tibia was now opened with a gouge and a small pus cavity evacuated. The wound was packed with wet bichloride gauze (1-5000), covered with a dry gauze dressing, and a posterior splint applied.

After this operation the patient failed to improve. The high temperature persisted, and the infection gradually spread into the adjacent soft parts, forming an extensive cellulitis just below the knee-joint. On March 29, 1909, Dr. Russell performed subperiosteal resection of the tibia. The incision was carried through the periosteum, which was stripped from the entire shaft of the bone and retracted. The bone was now sawn through just below the epiphyseal line at either end, and the shaft removed. The periosteum was then sutured with interrupted plain gut, approximating the two edges as closely as possible, thus filling in the space formerly occupied by bone. The skin was closed with silkworm gut and a strip of iodoform gauze inserted at the upper end of the wound.

A pathological examination of the specimen of bone showed that the entire shaft was filled with pus. The cortex was somewhat thickened and had a worm-eaten appearance. The periosteum was much thickened and was readily stripped from the bone.

After the first operation, on March 2, there was no complaint of pain in the leg until the sixth day. Very severe pain was then complained of, and the X-ray showed the extension of the osteomyelitic process, so that on March 29 the tibial bone was entirely resected. The tension sutures were removed on the fifth day after this operation. An X-ray, taken on April 21, 1909, showed a new formation of bone inside the periosteum. On May 7, the patient fell out of bed, sustaining a fracture through the lower third of the right femur. His further convalescence was uninterrupted, and a series of X-ray pictures taken during the following months showed the progressive formation of tibial bone, although the outline of the tibia was very irregular. The temperature, which was usually normal, at times fluctuated between 99° and 100°. The patient's general condition gradually improved, and the X-ray showed a steady strengthening of the tibia, its outlines becoming more definite and regular. Various plaster splints were applied and re-applied, until, at the time of his discharge from the hospital, on March 4, 1910, the patient was able to go about on crutches and could place a great deal of weight on the affected leg. The incision of the operation had entirely healed. Pathologically, the case was pronounced one of acute suppurative osteomyelitis, with no evidence of tuberculosis. Now, five years after, he had been perfectly well, with no recurrence. The wound remained healed, and the last X-ray, taken a few days ago, showed a firm though somewhat irregular bone.

OSTEOMYELITIS OF THE FIBULA.

DR. RUSSELL presented a boy, two and a half years old, who was admitted to the Roosevelt Hospital on April 16, 1913, with the history that eight months previously the right lower leg had become swollen, painful and tender. The family physician was consulted, who incised the leg several times, with the evacuation of pus, and resulting in the formation of a discharging sinus. On April 19, 1913, Dr. Russell did a subperiosteal resection of the fibula from epiphysis to epiphysis, as in the two previous cases.

FIG. 1.

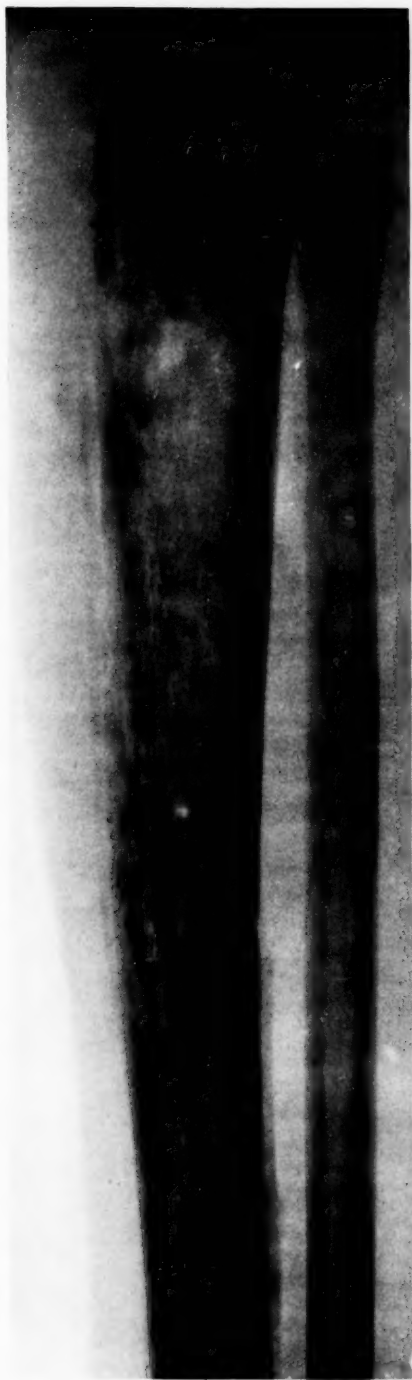


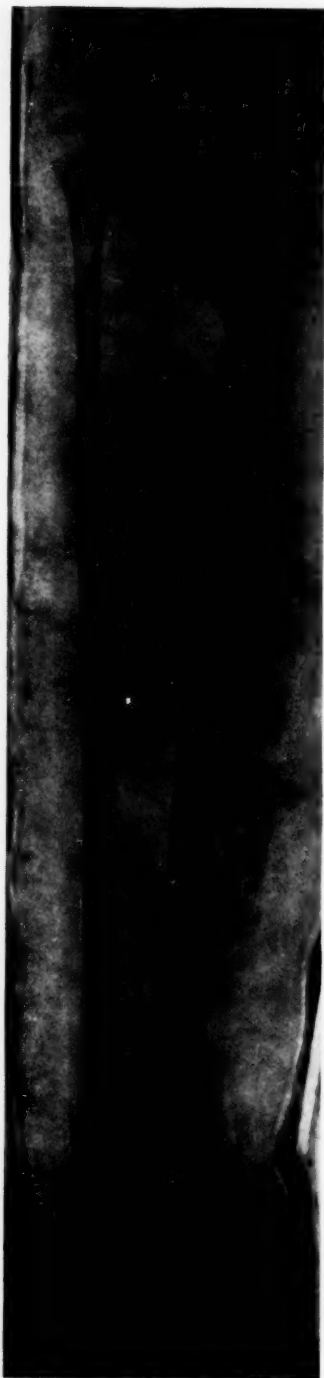
FIG. 2.



R. L. X-ray taken before removal of tibial shaft. The amount of bone involved is clearly shown.

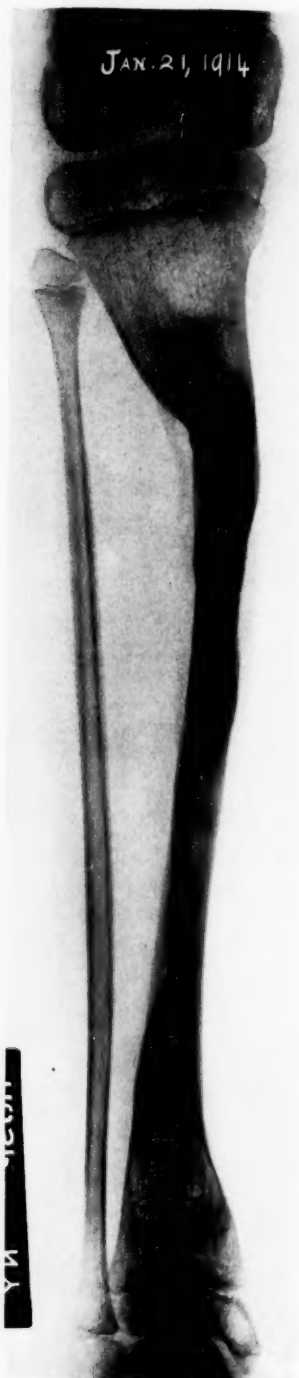
R. L. X-ray two weeks after removal of bone.

FIG. 3.



R. L. Ten months later—picture showing insertion of bone graft at point of non-union.

FIG. 4.



R. L. X-ray twenty-two months after removal of shaft.

The temperature reached normal on the second day after the operation, and the patient's convalescence was uneventful.

The series of X-rays showed a developing bone which had not yet completely re-formed. Dr. Russell said that after waiting for some time, if the bone did not completely re-form, he would do a bone graft.

RE-FORMATION OF TIBIA AFTER OSTEOMYELITIS.

DR. WILLIAM A. DOWNES presented this case, with lantern slide illustrations (Figs. 1-4). The patient was a girl, eight years old, who was admitted to St. Francis Hospital on March 13, 1912, with the history of pain and swelling in the left leg, just below the knee, of one week's duration. The temperature, on admission, was 102°, pulse 140, and the child was apparently very ill. Examination showed a spindle-shaped swelling involving the upper part of the leg.

Under general anæsthesia, a four-inch incision was made over the anterior surface of the leg, and a large amount of pus evacuated. The epiphysis and upper half of the shaft of the tibia were entirely bared of periosteum. The wound was left open. The child's condition improved, and on April 3 the incision was carried down to the lower epiphysis of the tibia, and a subperiosteal resection of practically the entire shaft of the bone was done. A small portion of the upper and lower ends of the diaphysis were apparently healthy, and these were left. As there were no symptoms of infection at this time, the wound was closed and a plaster-of-Paris case applied. The wound healed rapidly, and by July 3 the X-ray showed considerable bone formation.

On November 23 the picture showed that regeneration of bone was proceeding rapidly, but that non-union existed between the newly formed bone and the upper remaining portion of the tibia. The condition was practically unchanged on December 26, 1912.

On the 18th of the following February, when the child was re-admitted to the hospital, there was marked regeneration of bone, but the point of non-union was still present. A bone graft, an inch and a half long, was removed from the opposite tibia and inserted at the point of non-union, and the plaster case re-applied.

On March 10, 1913, the wound was healed throughout, and the X-ray showed some new formation of bone at the site of the

graft. By May 17, there was firm union at this point, and by July 21, the tibia was re-formed throughout. The plaster was then removed, and a hip splint applied.

At the present time (January, 1914) the X-ray showed a perfectly solid tibia, at least two-thirds the size of the normal bone, and the point at which the graft had been inserted could no longer be made out. The knee and ankle joints were in perfect condition; there was no shortening nor deformity, and the child had complete use of the limb.

DR. CHARLES N. DOWD asked in which class of cases it was best to do a complete subperiosteal resection of the diseased bone, instead of leaving a thin shell of bone to help maintain the shape of the bone and assist in its re-formation, as had been recommended by some, who claimed that this latter method gave better results, and that complications were less apt to occur. In one case, Dr. Dowd said, where the entire bone was bathed in pus, he left a thin, posterior shell of bone, and his results, he thought, were better than if the entire bone had been resected. Shortening was less likely to occur, and the re-formation of bone progressed more rapidly.

DR. RUSSELL said that in the very acute cases, such as one of those he had shown, where the operation was done about six weeks after the onset of the disease, he sutured the periosteum and also the external wound, leaving only a small drain. In this case there was slight suppuration of the skin wound, but this subsided in a few days and the wound then closed. In one of the other cases he closed the wound entirely and primary union followed. This of course was unusual in osteomyelitis, and he had emphasized it for that reason. There had been no complications in any of his cases, barring the fracture of the thigh in one case, which was of course purely accidental.

As for leaving a thin shell of bone, as suggested by Dr. Dowd, it seemed to him extremely difficult to accomplish this in dealing with a diseased tibia without fracturing the bone. His own results had been better by doing a complete subperiosteal resection than by the older methods.

DR. DOWNES said that in his case, at the time of the second operation, the child showed every evidence of having had a severe infection, and the blood supply of practically the entire diaphysis had been cut off. The section of the tibia that he had removed

looked like perfectly dead bone, and in this case, at any rate, there was no possibility of leaving a posterior shell. The importance of leaving the periosteum was well illustrated by comparing the result in this case with one that had come under his observation where the periosteum was evidently destroyed, and a complete loss of the diaphysis resulted. The patient had a six-inch shortening and a useless leg.

DR. ARPAD G. GERSTER said the patients shown were all children, in whom the process of bone regeneration was much more active than in grown people. The character of the attacks, too, was apparently of a comparatively mild type. In some cases of osteomyelitis the patients were so extremely ill and the destruction of tissue so extensive that this method of treatment could not be carried out at all; for example, in very septic cases, with a gangrenous periosteum, and great destruction of tissue resulting from tension. In the milder cases, the old-time methods of treatment would probably have given equally good results. This new method was particularly indicated, he thought, in old, sluggish, chronic cases, with discharging fistulæ, the patients wandering from one hospital to another and remaining uncured until the nidus of infection was radically removed.

This entire subject, Dr. Gerster said, was a very important and interesting one, but we should not lose sight of the fact that we could not resect and save every bone in osteomyelitis. We could not generalize; every case had to be treated on its own merits, this by one method and that by another. More study of the varieties of suppurative osteomyelitis, and more precision as to an intelligent indication based on pathological condition, were necessary.

ARTERIOVENOUS ANEURISM OF THE SUPERIOR THYROID ARTERY AND VEIN.

DR. WILLIAM A. DOWNES presented a woman, thirty-five years old, unmarried, who was admitted to the New York Hospital on April 22, 1913, with the history that seven years ago she was operated on for goitre in a hospital in Pittsburgh. Judging by the history, the goitre was probably of the exophthalmic type and about the size of an orange. Six months later she began to notice a throbbing in the right side of the neck, occasionally accompanied by a sharp pain. This continued until about four years ago, when

she had a severe, sudden, sharp pain which lasted several days, and was soon followed by a swelling in the right side of the neck. Accompanying this swelling was a purring sound. The swelling gradually increased until it reached the size of a goose egg.

Examination at the time of the patient's admission to the hospital showed the usual signs of an aneurism, and from its location it was thought to spring from the common carotid artery. However, on operation, which was done by Dr. Downes on April 22, 1913, the aneurism was found to have formed between the superior thyroid artery and vein, and he was able to ligate the artery between the external carotid and the aneurism, and similarly the vein leading into the aneurism, and then remove the aneurismal sac *in toto*. It was about the size of a hen's egg, and besides the artery and vein, entering the proximal pole of the sac, there were two small vessels attached to its distal end which disappeared under the muscles across the median line. The patient made a perfectly satisfactory recovery.

ARTERIOVENOUS ANEURISM OF THE FEMORAL ARTERY AND VEIN.

DR. GEORGE D. STEWART presented a police officer, thirty-eight years old, who, in July, 1911, while making an arrest, was shot five times, three of the bullets entering the arm, one penetrating the lower part of the abdomen and one the groin. As a result of the latter, he developed a tremendous hæmatoma of the scrotum, and when he left the hospital at the end of 46 days, there remained a tumor in the right femoral space, which was recognized as an arteriovenous aneurism.

When Dr. Stewart first saw the patient, in November, 1911, this tumor in the right femoral region was present. It gave a distinct thrill, and was undoubtedly a communication between the right femoral artery and vein. As a preliminary measure, continuous pressure was applied over the swelling with little or no effect.

Operation, December, 1911: Upon exposing the tumor, the artery and vein were found lying side by side, and merged for a distance of about three inches. Instead of proceeding in the usual way, Dr. Stewart said he acted upon a suggestion made by his assistant,

Dr. Arthur M. Wright, and created a new partition between the artery and the vein by taking a fine needle, similar to that used by Carrel in doing his arterial anastomosis, and inserting a double row of sutures between the two vessels. The needle was passed back and forth, the interrupted stitches being placed very close together, covering the entire distance where the vessels were merged together, until finally the thrill in the artery ceased. By this method the vessels were not opened, and no blood was lost. Since the operation, which was done in December, 1911, there had been no return of the thrill, and the patient had remained entirely well.

Pulsation in the artery below the aneurismal communication was noted during and after the operation, when it was apparently increased in volume. As the pulsation still persists in popliteal dorsalis pedis and posterior tibial there has probably been no clotting at the site of operation.

DR. GERSTER said the case shown by Dr. Stewart was certainly treated on very original lines, and as far as safety was concerned, it was very commendable, as the interior of the blood-vessels was not invaded. It would be interesting to study the specimen of a case thus treated. Evidently a collateral circulation had been established before this aneurism developed, and the result, perhaps, would have been just as good if the vessels had been tied.

EXCISION OF GASTRIC ULCER, FOLLOWED BY HOUR-GLASS CONTRACTION OF THE STOMACH.

DR. F. KAMMERER presented a patient who had come under his care a year ago for a chronic ulcer of the stomach. At operation, a perforating saddle-ulcer, involving more of the posterior than the anterior surface of the stomach and firmly imbedded in adhesions, was found about midway between the cardia and pylorus on the lesser curvature. The ulcer was removed by a wedge-shaped excision, taking in about two-thirds of the transverse diameter of the stomach. After the defect in the latter had been closed by several rows of sutures it was evident that considerable tension was now exerted upon the pylorus, but the condition of the patient was such that an additional gastro-enterostomy was deemed inadvisable. A small tampon was introduced for a few days through the upper angle of the wound. The patient's recovery was rather stormy, a large intraperitoneal

abscess forming on the right side, which had to be opened at the end of the second week. Finally, healing took place, but after half a year the patient was again put on the operating table for gradually increasing symptoms of gastric retention. At the second operation, what appeared to be a normally shaped stomach, somewhat small, was found firmly fixed by adhesions against the posterior abdominal wall and spinal column. A posterior gastro-enterostomy being out of question, the anterior operation was done with a Murphy button, and an entero-enterostomy added. The desired effect did not follow this procedure, although the button was passed during the second week. The condition of the patient grew steadily worse. He lost weight, was nauseated after meals, vomited frequently, and was greatly relieved by lavage of the stomach. X-ray examination showed a dilated stomach lying somewhat to the left of the median line, filled with bismuth, and an intestinal shadow, beginning about three inches above the lowest point of the stomach to the right, giving the impression of a contracted gastro-enterostomy opening. At a third operation during November, the anastomosis between the stomach and intestine was found to easily admit two fingers, the pylorus was open and the stomach appeared as it did at the last operation, about six inches long and three or four inches wide, with a well-developed larger curvature meeting the lesser curvature in dense adhesions beneath the left costal border. To expose all these parts a great many adhesions had to be separated, and, thinking that the latter had perhaps prevented the proper functioning of the entero-enterostomy and had established a kind of vicious circle, the stomach was divided near the pylorus and both ends closed in the hope of forcing the gastric contents through the gastro-enterostomy. There was not the slightest amelioration in the patient's condition following this third operation. Several further X-ray plates were taken. On comparing these with the former plates, the speaker was, for the first time, struck by the fact that the stomach in the plates was invariably situated further to the left than he had found it at operation, and then, also for the first time, the possibility that we had been dealing with two different cavities at the X-ray examinations and the later operations suggested itself. A fourth operation cleared up the situation entirely. After separation of dense adhesions to the left, the cardiac pouch of an hour-glass stomach was exposed. A second gastro-enterostomy was

done, uniting this pouch with a lower coil of intestine, and also a second entero-enterostomy. The patient was immediately relieved of all his symptoms.

After the first gastro-enterostomy, the efferent loop of jejunum had been drawn over by adhesions to the left, toward the cardiac pouch of the stomach, and, when later on a bismuth meal was given, a small portion of the latter evidently passed into the pyloric pouch and then into the efferent loop of jejunum, giving the impression on the X-ray plate that the anastomosis was situated at the point where this loop was attached to the cardiac pouch. In reality, gastro-enterostomy had been done with the pyloric pouch. The case demonstrated the difficulties of secondary operations after extensive adhesions in the abdominal cavity, and also difficulties in the way of a correct interpretation of some X-ray plates.

DR. GERSTER said some very practical conclusions could be deduced from the case shown by Dr. Kammerer. One was the great importance, when the abdominal cavity was opened, to ascertain the anatomical condition of the parts under the guidance of the eye—not touch alone. This fact had been impressed upon him many years ago, when, after removing a tumor of the cæcum, he trusted to his sense of touch in making what he supposed to be an anastomosis, instead of which he formed a vicious circle which resulted fatally.

Dr. Gerster said that in two cases of saddle ulcer located on the lesser curvature of the stomach, he had followed practically the same procedure as that described by Dr. Kammerer, and after the excision of a large segment of the stomach wall, the normal configuration of the stomach was lost, and in one of the cases, where death occurred five days after the operation, the autopsy showed that the lesser curvature was entirely absent. In both of those cases he did a gastro-enterostomy. In a recent case, the ulcer was located midway between the pylorus and cardia, closely approaching the site of a previous gastro-enterostomy. A resection was contemplated, but how to proceed was rather puzzling. Posteriorly was the stoma of the old gastro-enterostomy, and in order to leave this undisturbed he cut through the pylorus and did a right-angled resection, leaving a stomach that resembled a segment of large intestine. In this case, malignancy was subsequently demonstrated in the specimen.

DR. HOWARD LILIENTHAL, speaking of the troublesome adhe-

sions that Dr. Kammerer had encountered, said he was inclined to believe that if gauze packing was prevented from coming in contact with the gut throughout the entire operation, the subsequent formation of adhesions, particularly in the upper abdomen, would be minimized. To prevent this contact between the gauze and abdominal contents, he had found the suggestion made by a writer many years ago an excellent one. It consisted in the use of a strip of stout rubber dam; into this a small hole was punched, and through this opening (stretched) the tissue or organ upon which it was intended to operate was drawn. This gave an absolutely clean field, and when the operation was complete the parts were returned to the abdominal cavity without the hand or gauze having come in contact with the peritoneum: nothing but retractors, rubber gloves and instruments.

DR. JOHN A. HARTWELL said he recently had a case very similar to the one shown by Dr. Kammerer, where a large saddle ulcer extended from the pylorus over both the anterior and posterior walls of the stomach. In that case he did a resection much like that described by Dr. Gerster, and closed the upper end of the pylorus. He then did a posterior gastro-enterostomy. The immediate result of the operation was good, but death occurred within a few days, and the autopsy showed that while the wound in the stomach had healed satisfactorily, there had been a severe peritonitis in the lesser sac. In this case, a preliminary gastro-enterostomy had been contemplated, but the patient's suffering was so intense that it was decided that it would not answer the purpose.

DR. DOWNES said that about four years ago he looked up the subject of hour-glass stomach, and found at least half a dozen cases reported in which gastro-enterostomy had been performed where the distal pouch had been used instead of the proximal in forming the union between the intestine and stomach, with the result that the cases had gone on to fatal termination. He thought Dr. Kammerer was to be congratulated upon making the discovery early enough to correct the condition and save his patient.

DR. KAMMERER, in closing, said he thought the adhesions in this case were due to the large intraperitoneal abscess which formed after the first operation. He agreed with Dr. Gerster that as much of the field of operation as possible should be brought

under the eye, but in this instance the adhesions were so abundant and firm that he did not feel justified in trying to separate them during the later operations without a distinct indication.

RESECTION OF THE FEMORAL VEIN FOR THROMBO-ANGEITIS OBLITERANS.

DR. HOWARD LILIENTHAL presented a man, thirty-two years old, who was admitted to the Mt. Sinai Hospital on November 15, 1913, suffering from a thrombo-angeitis obliterans affecting both lower extremities. Five years ago he had been a patient there with the same disease, and was discharged unrelieved. Two years ago he had returned to the hospital complaining of numbness and pain in the left foot, his previous trouble having been limited to the right foot. He remained in the hospital almost a year, and during that time four toes on the left foot and one toe on the right foot were amputated. With very slight remissions, the symptoms had progressed, an ulcer at one of the cicatrices of the left foot having failed to heal, and giving rise to constant, severe pain. He also complained of numbness in his fingers.

At the time of his present admission there was no pulsation in either foot. The feet were much reddened. The veins in both lower extremities were apparently very small, and there was an ulcer the size of a silver quarter of a dollar in the line of the former amputation. The pulse was 120; respirations, 24; temperature, 100.6°. The urine was normal.

The patient was seen by Dr. B. Sachs, who expressed the opinion that it was one of incipient Raynaud's disease. The pain was excessive, and could not be relieved by any form of dressing. The patient having expressed a desire for amputation, Dr. Lilienthal advised arteriovenous anastomosis as a preliminary measure, with the hope of postponing the necessity for amputation.

Operation, December 8, 1913: Upon exposure, the femoral artery was found to be of normal size, the only apparent abnormality being the increase in the number of vasa vasorum. The femoral vein, however, at the beginning of Hunter's canal was very much smaller than the artery, and its walls were greatly thickened. The operation originally planned, therefore, was abandoned, and the femoral vein was doubly ligated and a section removed between the ligatures. The operation of ligating the femoral vein in this condition, Dr. Lilienthal said, had been

advised by Coenen and others. (See Dr. Leonard Freeman's paper, *Trans. Amer. Surg. Assoc.*, 1913.) The wound was closed by deep and superficial sutures.

There was no particular change apparent in the circulation of the foot immediately after the operation. A few days later, however, the patient stated that there was some relief from the intense pain, and the circulation of the foot was certainly no worse than it was prior to the operation. From this time on the patient improved rapidly and, by January 20, 1914, the ulcer had practically healed, the pain had entirely disappeared and the patient insisted on returning to his home.

THROMBO-ANGEITIS OBLITERANS: MULTIPLE LIGATION OF
VARICOSE VEINS OF THE LEG.

DR. LILIENTHAL presented a man, fifty-one years old, who for three years had suffered from the characteristic pain and other symptoms of a thrombo-angitis obliterans. The left foot was the one principally involved. The pain extended up the calf of the leg, and became so severe that amputation was consented to.

On December 26, 1913, it was Dr. Lilienthal's intention to ligate the femoral vein, but after the patient was on the table it was decided instead, as a preliminary measure, to ligate the large, multiple varicose veins of both legs, and this was accordingly done by Dr. Ira Cohen, the house surgeon. Following this procedure, the patient was completely relieved of his symptoms, and left the hospital about two weeks after the operation.

Dr. Lilienthal said that in both of these cases, as, in fact, in all the cases that had come under his observation, the patients were addicted to the excessive use of cigarettes.

DR. WILLIAM C. LUSK said he thought the probable syphilitic nature of endarteritis obliterans should be taken into consideration. In the case he had shown before the Society last spring (*ANNALS OF SURGERY*, November, 1913, p. 670) in whom the symptoms had been relieved and function was becoming restored in conjunction with the use of the Schnee four-cell electric bath, during the past summer the sinus in the little toe had grown larger and bone became exposed in its bottom, and there was some slight return of the pain, which, it seemed, could practically be held in abeyance by the daily use of the electric bath. Mixed treatment for about 4 weeks, followed by neosalvarsan 0.45, had caused no marked improvement, but after a second dose of salvarsan (old) 0.2 the sinus

quite suddenly, in the course of 10 days, healed up completely. Also the tendency to pain then promptly diminished and, with regular injections of mercury and an occasional salvarsan, disappeared completely. This patient had a history of syphilitic infection, but his Wassermann, on repeated taking, had always been negative or doubtful. In a second case referred to him by Dr. C. G. Burdick, treated with the electric bath, while the pain was generally relieved for a number of hours following the bath, yet the foot was very swollen and a commencing gangrene spread, so that the foot had to be amputated. The treatment of two other cases had been begun about two weeks previously. One of these, referred by Dr. H. H. Janeway, had a history of syphilitic infection 9 years ago, though the Wassermann was now negative. The left foot had been amputated. The right foot was a little swollen and on the inner side of the great toe there was an ulcer about $\frac{1}{2}$ inch in diameter, of 4 weeks' growth, and in and around the great toe there had occurred attacks of burning pain for 3 weeks, mostly at night. The treatment had consisted of intramuscular injections of salicylate of mercury at five-day intervals, 10-grain doses of potassium iodide, and a daily four-cell electric bath. At the present date the ulcer had already scabbed over and was now perfectly dry, and the foot was no longer swollen. For the past two nights the patient had slept in perfect comfort.

NOTE.—February 13, 1914. The patient is now entirely free from pain and is active. Baths stopped February 3. Antispecific remedies continued.

The other case was one in the service of Dr. T. A. Smith at Bellevue Hospital and was of an advanced type. He had, before the present treatment, suffered uninterrupted pain for 9 months, the great toe had become gangrenous, the adjoining skin was cyanotic and the whole foot swollen. Wassermann strongly positive. In the past 2 weeks the patient had been given injections of mercury, small doses of potassium iodide and a daily electric bath, with the result that following the bath there had generally resulted several hours of respite from pain. Dr. Lusk said that the electric bath for the relief of pain in these cases was best used with a current of 10 ma. for 10 minutes.

DR. A. V. MOSHCOWITZ said he had long been under the impression that this was a disease in which syphilis could be ruled out. They saw many of these cases at Mt. Sinai Hospital, and most of them did not give a syphilitic history, nor was the

Wassermann reaction positive. Because some of these patients were improved by mixed treatment and salvarsan, it did not prove that they were necessarily syphilitic, and if the Wassermann was negative, we might safely assume that syphilis could be ruled out. The disease seemed to be especially prone to occur in men of Jewish extraction who were heavy cigarette smokers, but a number of cases had been reported by the surgeons in soldiers of Christian and Mohammedan religions, who served in the recent wars in the East.

DR. GERSTER said that Dr. Leo Buerger had recently written a very creditable work on the subject of this disease, but the result of his pathological studies still left us in the dark as to the essential etiological factor that gave rise to it. Whether it was tobacco, race, or syphilis, we did not know. We did not know why the blood-vessels of these particular patients degenerated in this particular fashion. Dr. Lilienthal had presented several cases where interference with the venous circulation produced a marked improvement in the subjective symptoms of the disease, of which the predominating symptom was the pain, which was so intense and persistent that the patients could not get any relief without the aid of opiates. Why should the resection of the veins relieve the pain? In other cases that had been reported, an arteriovenous anastomosis had produced a similarly beneficial result. Lacking a better theory, Dr. Gerster said, he would make the suggestion, that as most of these patients were extremely neurotic, and not of the phlegmatic type, that is over-sensitive to pain, it might be assumed that this or any other form of operative treatment acted the line of suggestion analogous to the temporary relief from epilepsy after certain operations on the skull or elsewhere.

DR. HARTWELL said they had one case of endarteritis obliterans, at Bellevue Hospital, where one leg had to be amputated and the other was affected. That patient had never smoked, while his father, who was an inveterate smoker, had lived to the age of 83 without developing this disease.

DR. LILIENTHAL said that in all of their cases the usual tests for syphilis had been made, with negative results. While they had not tried the electrical baths, to which Dr. Lusk referred, they had tried electricity without any benefit.

Replying to Dr. Gerster, the speaker said this was a disease of men, not women, and the latter were generally more neurotic than the former, and for that reason he thought a neurosis could be

ruled out. Besides, a neurosis would not explain the pathological changes found in the arteries. In two of the cases he had seen, the patients subsequently became insane, possibly from arterial changes in the brain. In addition to the pain, the appearance of the extremities indicated some real pathological condition, and in one of the cases examined by Dr. Buerger, there was ossification and obliteration of the vessels. Aside from arteriovenous anastomosis and the relief following the operative procedures in the two cases shown to-night, amputation had hitherto been the only recourse.

DR. GERSTER said he did not wish to be understood as claiming that this malady itself was a neurosis; only that the excessive pain was possibly neurotic in character. The operation described by Dr. Lilienthal was certainly a valuable addition to our knowledge in the treatment of these cases, even if the results obtained by it could not be explained on pathological grounds.

ANTERIOR DISLOCATION OF THE HEAD OF THE RADIUS,
WITH FRACTURE OF THE ULNAR SHAFT:
OPEN REDUCTION.

DR. WILLIAM DARRACH presented a girl, four years and five months old, who on May 25, 1913, fell off a toy wagon, striking her forearm on a stone. The forearm was put up in splints within a few hours after the accident, and four weeks later, when the splints were removed, motion at the elbow was found to be limited.

A week later, a number of X-ray pictures of the joint were taken for the first time, and the patient was referred to Roosevelt Hospital. At this time, flexion at the elbow was possible to 80 degrees (10 degrees beyond a right angle), and extension was possible to 160 degrees (within 20 degrees of a straight angle). Pronation and supination were both limited to one-half the normal degree, and the head of the radius could be distinctly felt displaced forward. The X-ray showed a fracture through the upper part of the ulna, with moderate anterior bowing. On July 2, thirty-eight days after the injury, under gas and ether anæsthesia, a curved incision was made over the dorsal, lateral aspect of the forearm, extending from the line of the elbow joint downward for a distance of three inches. The ulnar fracture was broken up, and the head of the radius approached from behind the radial carpal flexor. The radial head was found lying anterior

to the capsule. An attempt was made to reduce the dislocation by traction, but the opening in the capsule was too small to admit the head.

A vertical incision was made through the orbicular ligament, and a chromic suture passed through the mesial edge. This was then passed around the neck of the radius from behind forward, and to its inner side, the orbicular ligament being thus drawn around the head and neck of the radius, the latter easily slipping back into its normal position. The suture was then passed through the lateral edge of the cut ligament and tied, approximating the cut edges. The wound was then closed, using catgut for the deeper planes and silk for the skin. A plaster bandage was then applied, extending from the middle of the arm to the metacarpal region, with the elbow at right angles. The plaster was removed after three weeks, when the wound was found healed and the stitches were taken out. Flexion was now possible to 70 degrees, extension to 150 degrees and supination and pronation each one-quarter. The X-ray showed that the radial head was in its normal position, with good alignment of the ulna. A week later flexion was still limited to 70 degrees, extension to 170 degrees, while pronation and supination had increased to one-half the normal amount. On January 28, 1914, almost seven months after the operation, flexion was possible to 30 degrees, extension to 200 degrees, (20 degrees beyond a straight angle), while pronation and supination were complete and there was no pain or decrease in power. The radial head could be felt in its normal position.

FRACTURE OF THE ASTRAGALUS, WITH DISLOCATION BACK-
WARD OF THE POSTERIOR FRAGMENT: REMOVAL
OF THE FRAGMENT.

DR. DARRACH presented a man, twenty-two years old, who on March 17, 1913, while attempting to climb on a moving wagon, caught his foot in the spokes of the wheel. The foot was forcibly everted and rotated outward, and was said to have been dislocated outward, the skin over the internal malleolus being broken. He was taken to a hospital, where the foot was pulled back into position and bandaged, and on the following day he was allowed to go home. Eight weeks later he came to Roosevelt Hospital complaining of inability to walk because of pain below the internal malleolus and in front of the tibiotarsal joint. On examination, the right ankle was widened in the region of the malleoli and for a distance

of an inch below. Just anterior to the tendo Achilles there was a firm swelling, the size of a golf ball, which was very slightly movable on the underlying parts. It was not adherent to the overlying skin. There was no motion at the tibiotarsal joint, and the movements at the mid-tarsal joint were greatly limited. There was a scar just above the tip of the internal malleolus. Just underneath this there was marked tenderness, as well as over the lower tibial margin in front. The head of the astragalus could be felt in its normal position. An X-ray examination showed that there had been an oblique fracture of the astragalus, the anterior fragment consisting of a head, neck and the portion of the body adjacent to the interosseous groove. The rest of the body, containing the tibial, fibular and posterior calcanean articular surfaces, had been displaced backward. There was also a fracture of the lower extremity of the tibia involving the internal malleolus and adjacent portion of the anterior lip.

On May 16, 1913, under gas and ether, a curved incision was made behind and below the internal malleolus, and the posterior fragment shelled out of its bed and removed. After the removal of this, as the foot could now be flexed and rotated inward sufficiently to bring it well under the axis of weight-bearing, it was decided to leave the anterior fragment in place and see how much functional return would result. The wound was closed, and the foot and entire leg inclosed in a plaster-of-Paris bandage, the foot being flexed and inverted as much as possible. There was no reaction after the operation, and the patient left the hospital at the end of a week. The plaster was taken off at the end of three and a half weeks, when the stitches were also removed, the wound having healed primarily.

The patient returned to work three months after the operation, but still complained of pain referred to the front of the tibiotarsal joint. He then had 20 degrees of motion at this point. Six months after the operation there was still some pain below and in front of both malleoli when he first began to walk on it each day. This disappeared after about fifteen minutes, and did not return until after six or seven hours of continuous work. Building up the inner side of his shoe and the wearing of a metal arch support had decreased his pain and improved his gait. Eight months after the operation there was almost no pain in the ankle, and he walked without a limp. There was still a little pain when he first began to use it in the morning.

In view of the very satisfactory result in this case, Dr. Darrach said, it seemed wise not to remove the remaining portion of the astragalus in such cases, if the foot could be maintained in such position as to be well under the line of weight-bearing, and with sufficient flexion at the tibiotarsal joint to allow the toes to clear the ground without outward rotation in walking.

PROSTATECTOMY IN A GENERAL SURGICAL PRACTICE.

DR. HOWARD LILIENTHAL read a paper with the above title, for which see page 373 (March).

DR. HARTWELL thought that in many cases of enlarged prostate that were seen during a comparatively early stage, the prostatectomy could be completed at one sitting without any additional risk to the patient. In the class of cases described by Dr. Lilienthal, of course, the two-stage operation possessed distinct advantages. In doing the suprapubic operation, the speaker said, the possibility of a subsequent hemorrhage was always in his mind, and in one of his recent operations he recalled an article by Cabot, of Boston, who claimed that the bleeding was arterial, not venous, that these vessels were located in the mucous membrane, and that they could be seen by careful retraction of the parts. In this particular case, Dr. Hartwell said, after removing the prostate and retracting the tissues, he located four small spurting arteries in the mucous membrane, and after ligating these, the field remained perfectly dry.

DR. KAMMERER said he had done only the suprapubic operation during the past six years. He was not quite sure that the statistics presented by Dr. Lilienthal of the one-stage and two-stage operations gave a correct estimate of the value of the two procedures, as perhaps a number of cases with infected bladders had been subjected to a one-stage operation in the early days of prostatectomy, which would now be subjected to a preliminary cystostomy. He himself believed that the one-stage operation was justified where no infection had occurred. Postoperative hemorrhage after suprapubic prostatectomy, coming on several hours after operation, when the patients had been returned to the wards, had given the speaker more trouble than any other factor in the management of these cases. In six cases he had packed the bed of the prostate with gauze, bringing one end out through the incision into the bladder and fixing the tampon in place by two or three interrupted

plain catgut sutures passed through the mucous membrane of the bladder and the prostatic capsule (see *ANNALS OF SURGERY*, vol. 53, page 429). These sutures opened up in a few days and the tampon could be readily withdrawn. He had never seen anything suggesting retention in the bed of the prostate when this plan was followed. In four late cases he had tried Judd's suggestion of permanent irrigation of the bladder, and he was much impressed by its ability to prevent postoperative hemorrhage.

DR. GERSTER said he thought the two-stage operation in the class of cases reported by Dr. Lilienthal certainly seemed advisable, and the results he had obtained bore out his contention. By doing the operation in two sittings, shock was lessened, and as the first stage was done under a local anæsthetic, it scarcely counted. The rate of mortality he had reported was not high, considering the number of cases and the class in which it was performed. Some surgeons refused to operate in certain cases, fearing to increase their death rate, thus depriving some patients of the benefit they might derive from an operation.

Dr. Gerster said the preliminary diagnostic use of the X-ray in these cases as a routine measure, as suggested by the reader of the paper, was commendable. The speaker said its practice might have saved him from two rather disagreeable experiences. In both of these cases there was a large calculus in the ureter, which was only detected after the operation on the prostate had been undertaken. In one, the patient died from sepsis before the presence of the stone was suspected, while in the other it was found during the course of the operation and removed without difficulty.

DR. LILIENTHAL, in closing, said he had not had much trouble from hemorrhage in his cases. In some of his earlier cases, perhaps, the bleeding may have been a contributing factor in the fatal issue, but not in recent years. In comparatively young and middle-aged patients, where the operation could be done at leisure, he had repeatedly searched for and found the bleeding points, as suggested by Cabot, but the operation was a totally different one in old, feeble men, perhaps asthmatic or otherwise disabled. Recently, he had done the operation on a man 85 years old, very stout, with a septic cystitis, asthma and other complications.

When the operation was done in two stages, as he had described, and after removing the prostate, a heavy sand-bag was placed over the lower abdomen to keep the bladder collapsed and prevent the gauze packing from becoming displaced.

The speaker said he was strongly in favor of the preliminary use of the X-ray in all these cases as a routine diagnostic precaution. When he has to deal with a badly infected bladder, he tries to improve the patient's condition before doing the suprapubic operation. During the first stage of the operation, if the hemorrhage was alarming, you knew where to look for it, which was not the case when the operation was completed at one sitting.

DR. LILIENTHAL also showed a series of X-ray pictures demonstrating changes in the prostate. In these plates exposure had been made with the bladder full of air and the contrast with the solid prostate was well marked. The method had been devised by Dr. A. Hyman and it formed an additional means for pre-operative exact diagnosis.

NOTE.—It has been since ascertained that a similar method was employed by Burkhart and Flörken (*Deut. Zeit. f. Chir.*, vol. 105). They made use of oxygen gas instead of air.

DR. A. HYMAN (by invitation) said the expedient of filling the bladder with air, as a diagnostic aid in prostatic enlargement, was revealed to him by accident. He had a patient, a man about sixty, in whom calculus was suspected, and it was suggested to dilate his bladder with air in order to bring the outlines of the stone out more distinctly. The X-ray failed to show a calculus, but showed very clearly the outlines of an enlarged prostate. Since then he had resorted to this method in half a dozen cases, and in all of them the enlarged prostate was very distinctly shown. The measure was of course indicated in patients who could not be cystoscoped and where the enlargement of the prostate per rectum was comparatively slight. The radiographs were taken by Dr. Jaches of the Mt. Sinai Hospital X-ray department.

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ANNALS OF SURGERY,
227-231 South Sixth Street,
Philadelphia.